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THE
PRACTICE OF MEDICINE

BY THE LATE

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EIGHTH EDITION

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PREFACE TO THE EIGHTH EDITION

THIS Edition was called for after the death of my Father, and I have undertaken the preparation of it at the request of the publishers. I have endeavoured, while bringing the book, by careful revision, down to date, to retain as far as possible its original plan and text.

Besides a number of minor alterations, several articles have been rewritten and the descriptions of a few new diseases have been added. The prescriptions contained in the Appendix have, in many cases, been slightly altered to bring them into conformity with the requirement of the new edition of the British Pharmacopœia. The coloured plates of micro-organisms which appeared in the former edition have been replaced by Plates I.–III., which Dr. Hewlett was good enough to allow me to reproduce from his *Manual of Bacteriology*.

I am deeply indebted to Professor Stockman of Glasgow University for his kindness in supervising my work and in aiding me with his advice on points of difficulty, and my best thanks are due to my friend, Dr. Walter Colquhoun, who read the proof-sheets and made many valuable suggestions.

FRANK J. CHARTERIS.

GLASGOW, *November* 1899.

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GENERAL CONSIDERATION OF DISEASE

WITH

b v

BEDSIDE HINTS

WHAT is health? The answer to this inquiry can scarcely be given in the form of a definition, yet it requires no medical education to suggest a picture of what health is at the typical eras of human existence, when all the various functions of the human body are performed easily, naturally, and well. The healthy individual breathes without difficulty, the food taken is relished and properly assimilated, the blood is forced from its centre—the heart—onwards through the body, without valvular flaw or subsequent hindrance, and the brain with its nervous expansion, undisturbed by morbid fancies, controls the movements and the thoughts of the living organism. Disease is a deviation, to a greater or less extent, from what we thus realise, though we cannot define it, as the standard of health. It may invade one or more of the systems we have alluded to, and it is the duty of the physician to find out, by the varied appliances of his art, what and where the disease is. Thus the student will perceive, what practical bedside experience teaches, that diseases are to be referred in many cases to certain systems—viz. respiratory, circulatory, digestive, integumentary, genito-urinary, and nervous. Each of these systems being liable to various diseases, and the allocation to one of these systems having been made, it is the further province of the physician to ascertain, by a careful examination of the phenomena presented to him, what the particular disease which he is investigating may be. A little reflection or experience will, however, convince the student that all diseases cannot be brought under such a simple classification. For certain diseases of great importance depend upon the introduction into the system of a specific virus or contagium, and recent bacteriological research shows that some diseases, formerly regarded as *general diseases*, are in truth specific infectious diseases.

These, and other diseases not referable to one or other of the systemic diseases, will be dealt with afterwards.

In investigating real or imaginary disease, the question presents itself to us, How is the nature of the disease to be determined? How is the inquiry to be prosecuted?

Pain is a prominent feature in disease, and important information may be obtained by asking—

"Where do you feel pain?" Follow this up by further inquiring—

"How long have you been ill?"

The patient in this way refers his pain to some particular part or parts, and tells the story of his illness in his own words, without any promptings on your side, which may be misleading. Now, with certain data to go upon, and with no preconceived, and therefore probably erroneous, ideas directing you, the systematic investigation can be justly commenced. If attention is directed to the chest, that region must be carefully examined by Auscultation, Percussion, Mensuration, Inspection, and Palpation. In order to facilitate inquiry, and to localise its evidences, the chest has been divided into certain regions, as the accompanying diagram will at once show; a fact which beginners should realise, not merely by looking at it, but by drawing the corresponding lines in ink on a friend's or fellow-student's chest.

In Percussion the Pleximeter and Hammer may be used, or, in lieu of them, the first two fingers of the left hand may be applied flatly to the chest, and struck with the tips of the corresponding ones of the right. Being already familiar with the sounds in health, you compare one region with the corresponding region on the opposite side, and note whether the sounds produced by percussion are healthy or the reverse, abnormally dull or abnormally clear.

Proceed in a similar way with Auscultation, by means of the Stethoscope, after carefully reading the chapter on Respiratory Sounds in Health.

Palpation, *i.e.* the application of the hand, shows the comparative movements of the two sides of the chest. It indicates also the vibration communicated to the chest wall by the voice, or what is called "Vocal Fremitus." Mensuration, by means of a graduated tape, reveals also the comparative size of the two sides, and in some cases, by special instruments, tells the actual and comparative movements of the chest in respiration.

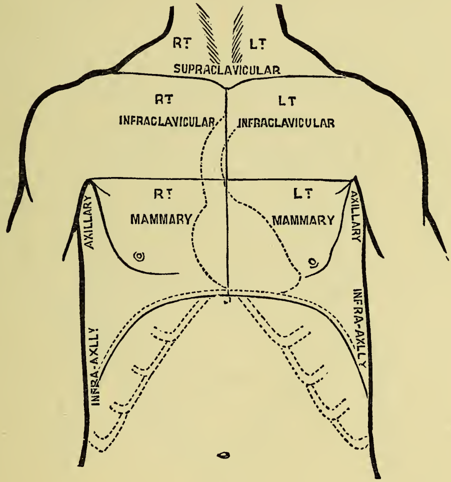

Fig. 1.

But supposing your patient does not refer his complaint to the chest, but to the stomach, then your inquiry must be directed primarily to the digestive system. Examine the tongue, ask as to his appetite and the state of the bowels.

Percussion and Mensuration are now of great importance. The abdomen has also been divided by lines, as in the accompanying diagram.

If the patient refers his ailment to the kidneys or the bladder, your inquiry must be particularly directed to the urine, for this is the keynote to diagnosis. Note its colour, take its specific gravity, etc. (See chapter on Urinary Diseases.)

If he refers his complaint to the nervous system, try to discover from the symptoms presented what disease it may be, remembering that the brain is complex in structure and function, and that the means which assisted you before are now of little avail,—"For the brain you can neither see, nor touch, nor handle." The subject is thus beset with greater difficulty than in the case of the other systems mentioned.

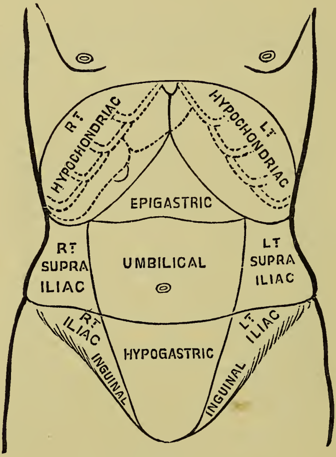

Fig. 2.

It is a matter of great importance, in the method of examination thus suggested, to remember that one system cannot be long involved without implicating, to a greater or less extent, some, if not all, of the others. While special attention is of course paid to the system containing the organ primarily diseased, it is essential that the others should not be forgotten. It is immaterial in what order they are considered, but it is important that no one of them be neglected; and it is astonishing how, after a little experience, the student quickly and instinctively goes over them all.

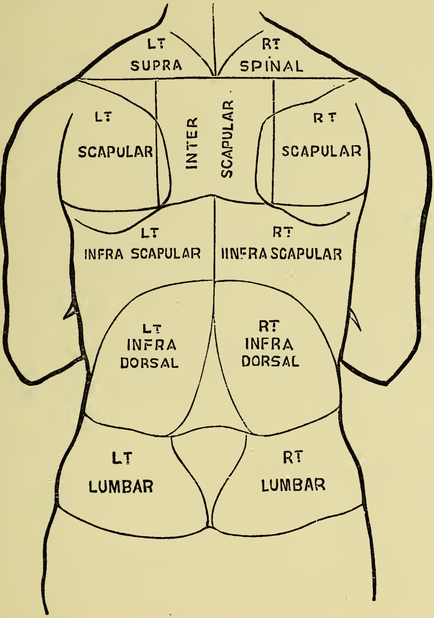

Fig. 3.

The student, therefore, in forming an opinion with regard to diseases connected with the various systems, or with regard to other diseases, will see that an important element in this opinion or diagnosis must be the causation, or etiology, of the disease in question. Is it peculiar to one country or to many? Is it a disease of youth or age? Is it hereditary, or is it acquired? Is it dependent on known or unknown agencies? Is it characteristic of sex or occupation?

Having thought these things over, having also gleaned what he can from signs, symptoms, and history, his further duty is to form a prognosis, or forecast of the probable issue. Will it be fatal, or the reverse? What complications may arise, and how may these be averted? These and all previous considerations have one definite object in view, viz. treatment, specially directed to the person who is ill, but also in certain cases prophylactic, *i.e.* guarding against the extension of the disease to others, if that be possible.

After these remarks, we shall now take up some morbid states and processes, and then proceed to the consideration of specific infectious diseases.

HYPERTROPHY

Hypertrophy signifies increase in the bulk of an organ or tissue from an additional number of or from unusual growth of its constituent elements, in normal proportions, without the addition of a foreign substance: the word *Hyperplasia* is sometimes used synonymously. As a rule, however, the term "hypertrophy" is most aptly employed to signify increase of an organ generally, while "hyperplasia" is often applied to proliferative growth of some particular tissue entering into the composition of the organ.

Hypertrophy thus differs from mere enlargement. Thus in the case of the heart, the thickening of the muscular walls of the ventricle, seen in many cases, is an hypertrophy, and is due to augmentation of the muscular fibres. On the other hand, infiltration of the cardiac walls with fat causes enlargement of the organ, but this is not hypertrophy.

A localised increase of an organ is not an hypertrophy unless the growth is composed of the normal elements of the part, when it may be spoken of as partial hypertrophy. More usually such local growths are of the nature of tumours.

The most common cause of an hypertrophy is an unusual demand on the function of a part or organ. Hypertrophy is thus a *compensatory* process, and an instance of this is seen in the thickening of the walls of the arteries, when resistance is offered in the capillaries.

Sometimes hypertrophy is spoken of as "false," but the use of the expression is not to be commended, as it signifies the deposit of a foreign material, as fat or other substance, which gives a part the appearance of being hypertrophied.

ATROPHY

Atrophy of an organ or tissue signifies reduction in size from wasting of its normal specific elements. This wasting is usually brought about from deficient blood-supply, or from pressure exercised by over-full vessels. In other cases there is inherent degeneration of the elements of the tissue. Atrophy is also found as a physiological process in the wasting of organs incidental to advancing age. Loss or impairment of function leads to atrophy. In two distinct diseases, both considered specially afterwards,—progressive muscular atrophy and infantile paralysis,—loss of power in the muscles is associated with marked and rapid wasting.

Any interruption of the nervous channels, either above in the cerebrum or below in the nerve-trunks, is followed by degeneration ending in atrophy of the whole nervous tract involved leading from the cerebrum to the peripheral termination. This is the so-called SECONDARY DEGENERATION of the cord. In muscular tissue, after interruption of nerve supply, the wasting is almost as constant. Overwork from undue mental activity may produce degenerative diseases of the nerve-centres, and excessive sexual indulgence may induce atrophy of testicles or ovaries.

HYPERÆMIA

This means an excess of blood, and may be either arterial or active hyperæmia, or venous or passive hyperæmia. Arterial hyperæmia is due to the relaxation of the walls of the arteries and consequent enlargement of the vessels, or it may depend on increased flow of blood through the ordinary channels being interrupted, and is then known as "Collateral Hyperæmia."

Examples of "Direct Arterial Hyperæmia" are seen in the result of a blow, or of heat, or in the reaction after intense cold; or it may be indirect, through the vaso-motor nerves being diseased and losing their contractile curb on the vessels.

Examples of "Collateral Hyperæmia" are observed when an embolus blocks up an artery, or when disease obstructs the chief arterial sources of an organ and leads to peripheral channels becoming hyperæmic, as in cirrhosis of the liver, granular kidney, and sclerosis of the spinal cord.

The symptoms of acute hyperæmia are redness, increase of temperature at the part, with swelling through distension of the vessels, but not by exudation, which is characteristic of inflammation. There is also usually a sensation of heat in the part, or itching.

"Passive hyperæmia" may be due to feeble circulation or obstruction in the veins.

The action of the heart may be feeble—so feeble that there is not sufficient impetus to send the blood forward on its return current to the heart. In the erect posture this will be seen in swelling and congestion of ankles and feet; or in the recumbent position in the nates, sacrum, and bases of the lungs (hypostatic hyperæmia). Cyanosis is the form of venous hyperæmia caused by imperfect formation of the heart, or as the result of certain diseased conditions of the lungs, as emphysema or chronic bronchitis.

Obstruction of veins may follow on a tumour, as in the swollen veins of the leg seen in pregnancy, or in the hæmorrhoids caused by pressure of hard fæces in the intestines. Venous obstruction due to disease of an organ may produce hyperæmia of the vessels supplying that part. Thus cirrhosis of the liver induces hyperæmia of the whole portal system. The symptoms of passive hyperæmia are evidenced in the veins being full of venous blood, and producing a uniform purple colour. There is no throbbing and no unusual heat of the part.

Chronic hyperæmia leads, if continued, to transudation of serum and migration of red corpuscles through veins and capillaries. Internal organs are first enlarged, but owing to inadequate vascular supply and nourishment they become smaller and atrophy.

On external parts of the skin there is a tendency to ulceration, or liability to inflammation on slight causes. Thus eczema frequently arises.

HÆMORRHAGE

Definition.—The escape of blood from any part of the circulation.

With reference to the site of hæmorrhage certain terms are used. Thus *hœmaturia* implies bleeding from the urinary tract; *menorrhagia*, excessive bleeding from the uterus at the menstrual periods; *metrorrhagia*, bleeding (between these periods); *epistaxis*, bleeding from the nose; *otorrhagia*, bleeding from the ear. In medical practice the two chief forms of hæmorrhage are hæmoptysis (spitting of blood) and hæmatemesis (vomiting of blood), and of the characters and causes of these a brief description will be given.

Hæmoptysis has its source in pulmonary or bronchial hæmorrhage, and when this is profuse the sputum consists almost entirely of bright red frothy blood, with hardly any trace of other matter. As the hæmorrhage diminishes in intensity the expectoration for several days exhibits a reddish or reddish-brown colour, and during this period leucocytes and epithelium are seen, the cells usually enclosing crystalline and amorphous forms of hæmatoidin. The formation of small cavities in the course of tubercle is the most common cause of pulmonary hæmorrhage; sometimes it is due to the rupture of an aneurysm developed from a branch of the pulmonary artery into the bronchi, and persistent hyperæmia of the lung due to heart disease may give rise to the condition. As a rule, in hæmatemesis the blood vomited proceeds from some serious lesion of the stomach, although it may at times occur independent of any such cause. When the hæmorrhage is considerable, clots of blood are found which are not at all, or but slightly, changed; but more commonly the effused blood remains for a longer time in the stomach, and is thereby altered in such a way that the oxyhæmoglobin is converted into hæmatin. In consequence the vomit has the appearance of *coffee-grounds.* When examined under the microscope no blood corpuscles are to be seen in it, but in their place larger or smaller pigment masses. It is necessary to remember that the giving of preparations of iron will impart to the vomited matter somewhat the same appearance as that due to blood; so also will the taking of red wine, and that the presence of bile pigment may cause it to assume a brownish-black colour. Vomiting of blood is chiefly observed in ulcer or cancer of the stomach, and large quantities of blood pigment may be found in the vomit in cases of duodenal ulcer with hæmorrhage into the intestines. It may also appear as the result of partial congestion, as in cirrhosis of the liver; or it may be vicarious. Both forms of hæmorrhage are termed in common parlance "vomiting of blood," but from what has been stated it is obvious that they depend on different conditions. It is significant that in hæmoptysis the blood is bright red in colour. It is frothy. It is attended with cough. It is partly mixed with other constituents of the sputum. It does not come up all at once, nor does it stop all at once, for the expectoration may reveal traces of blood for some days, and in the progress of the tubercular disease recurrences of hæmorrhage are not uncommon. The quantity brought up at a time varies from a tablespoonful or two to as much as two pints.

In hæmatemesis, giddiness and nausea are most likely to be felt, inasmuch as a considerable quantity of blood may escape into the stomach before vomiting occurs. The vomited blood is dark in colour. It may be mixed with food, and it is not preceded by a tickling cough. Further, as a rule, the quantity ejected is larger than in hæmoptysis, and the stools are "tarry" from part of the blood being carried into the intestine.

A peculiar condition of the body is known as the hæmorrhagic diathesis or hæmophilia, the subjects of which exhibit a remarkable tendency to profuse hæmorrhage even from trivial injuries.

DROPSY

Dropsy consists of the excessive accumulation of serous fluid in the subcutaneous cellular tissue or in a serous cavity.

It may in truth be said that dropsy is rather a symptom of a disease than a disease itself, and that therefore the term "dropsy" should be abandoned and only spoken of when the malady on which it depends is considered. This may be admitted to be a philosophical induction, but at the same time it is to be remembered that dropsy sometimes during life cannot be traced home to its causation, nor in some cases can we after death ascribe it to any organic change. Besides, the term has so crept into medical nomenclature that we cannot abandon it, and certain forms of dropsy are familiarly known by the part where the effusion has taken place.

When confined to the subcutaneous cellular tissue it is termed œdema or anasarca; to the peritoneal cavity, ascites. Should the effusion be into the ventricles of the brain, or the subarachnoid space, the term hydrocephalus is applied; when in the pericardium, hydropericardium; when in the thorax, hydrothorax; hydrocele when in the tunica vaginalis.

Pathology.—In considering the pathology of dropsy we must remember that continual exudation and continual absorption are going on in the tissues and serous cavities in health. Fluid exudes from the vessels and is absorbed partly by the veins and partly by the lymphatics. Several factors are concerned in the production of this fluid, either separately or in combination. Thus if obstruction occurs in a vein, œdema may follow at the lower part of the body, when the blood should return by the obstructed vein. Experimental evidence, however, shows that so long as the nervous supply to the region of the obstruction is intact, œdema may not be produced, for the lymphatics are able to return all the fluid which exudes from the capillaries. Thus if the sciatic nerve of a dog is divided, and a ligature is applied to the vena cava, the corresponding leg will become œdematous; but if the nerve is untouched no œdema will result. The chemical condition of the blood has also a marked influence, as it is found that the injection of certain albuminoids into the circulation will cause extravasation of both fluid and red blood corpuscles. It is also supposed that the endothelial cells of the blood-vessels may be changed so as to possess a secreting action.

Œdema is observed in diseases associated with weakness and poverty of the blood. Thus in anæmia or purpura the composition of the blood is notably altered, and œdema is seen at the ankles, but without any obstruction of the veins. This is induced by the feeble action of the heart, which causes a slow circulation and a tardy return of the blood to the central organ.

So also the œdema of scurvy may be explained.

There is little doubt that the œdema noticed in the later stage of phthisis would be apparent much sooner, were it not for the colliquative sweating so markedly associated with this disease. After these remarks we will now speak of the three leading forms of dropsy, which may be referred to the heart (cardiac), to the kidney (renal), to the liver (hepatic).

Cardiac Dropsy.—In heart disease œdema always commences in the lower extremities; at first it is scarcely noticeable, then it is detected in the evening at the ankles and the dorsal aspect of the foot; but after a night's rest it is not seen in the morning. As the disease advances, the dropsy creeps upwards, first up the lower extremities, then into the scrotum, enlarging the penis; finally it comes to the superior parts, being observed in the hands, and in the very worst cases it appears even on the face.

The first internal cavity which suffers from transudation is the peritoneum, for local causes are here at work, in the affection of the region of the portal vein. Next to this come the pleural cavities, especially the left one, and with it generally the pericardium. Dropsy is not a mere symptom of cardiac disease—it is a link in the chain which literally clasps the patient suffering from this affection. The transuded fluid presses on the smaller vessels, creating new resistance to the circulation, and making fresh demands on the activity of the ventricles. The skin soaked with serum is disposed to inflammation, and when the œdema is very extensive, blisters arise. These burst, and then follow erysipelatous or deep-seated inflammation and tedious suppuration, which generally usher in the final stage.

Other causes than the impeded circulation operate, however, in producing cardiac dropsy. These are probably disturbances in the vascular innervation, which will lessen the propulsive force proceeding from the vessels. Another factor is the loss of albumen and solid components which the blood undergoes.

Renal Dropsy.—Old writers, as Hippocrates and Van Helmont, observed that the diminution of the urinary secretion was a cause of dropsy, yet the connection, as cause and effect, between kidney disease and dropsy was not understood until Bright published his observations. He showed that albuminuria was associated with kidney disease, and the loss of albumen rendered the blood watery; hence *hydræmia* was supposed by many to be the cause of renal dropsy. Yet further investigation proved that the hydræmic theory was in many cases untenable.

It was found experimentally that even a "hydræmic plethora" is insufficient to produce œdema. Hence it has been considered by many that an inflammatory alteration occurs in the vessels of the skin, thus causing œdema—an alteration resulting from the circulation of poisonous agents in the blood. The loss of albumen leading to anæmia likewise aids in the production of dropsy. It is clear, however, that the non-removal of water from the system, while the absorption of water is still going on as in health, has a potent influence in the production of the œdema, for the less the quantity, the more severe will be the dropsy, and the latter will fall directly, when the water can again flow off by its natural channels. From the above causes, then, the origin of dropsy in acute and subacute nephritis may be explained. But in chronic nephritis other additional causes often operate, for the paralysis of the hypertrophied left ventricle, which is finally produced, leads to disturbance of compensation, and results in the true general dropsy of stasis, which is analogous to what has been depicted in uncompensated heart disease.

The aspect of the dropsical fluid in life varies. That obtained from the connective tissue is generally as transparent as water; that taken from any of the serous cavities of the body is pale yellow or light green in colour, with fine, thread-like shreds or coagula floating in it.

The composition of the dropsical fluid in the dead body varies according to the site from which it comes. The fluid in the subcutaneous connective tissue is poorest in solid constituents and albumen; thus it may contain 0·36 per cent, while the fluid contained in the pleura may contain 2·85 per cent, and from the peritoneal cavity 1·13 per cent.

Renal dropsy begins first as general anasarca, and may exist thus for some time before it invades the great serous cavities of the body. The particular part of the body which first shows signs of becoming œdematous depends upon whether the patient lies in bed or moves about. If walking about, the first thing noticed is usually slight puffiness at the ankles when undressing at night; if lying in bed, there is observed swelling in the eyelids when he gets up in the morning.

Peculiar also to renal dropsy is the fact that the swellings change their sites. Thus the eyelids which were swollen in the morning may in the evening be free from any œdema while the feet are found to be swelled; or if lying in bed on one side, that side of the face on which the patient lay will be found considerably swollen, while the other will be unaffected.

The influence of gravitation doubtless explains partly these appearances, yet we are unable to understand why sometimes in renal disease the dropsy is circumscribed, or presents itself in unwonted situations, and remains there occasionally with strange persistence. Possibly, however, the blood-vessels in these situations have undergone more serious injury.

The swelling of the whole body in renal disease may sometimes be very extreme, and as such it may last for a long time. The graver forms of renal dropsy are usually sooner or later complicated by effusions into the serous cavities, or by œdema of the lungs, or of the mucous membrane of the stomach and intestines.

Hepatic Dropsy.—In addition to the two forms of dropsy mentioned, cardiac and renal, we have serous transudation into the peritoneal cavity, occurring as the first feature of dropsy, and resulting from obstruction to the abdominal vessels, particularly the portal vein. This is termed Ascites, and in an adult man, when primitive, seems to be dependent on cirrhosis, cancer, perihepatitis, simple chronic atrophy, or syphilitic affections of the liver. Ascites may, however, occur as a part of general dropsy, and in children also slight serous effusions into the peritoneal cavity may be seen in the course of acute diseases.

The nature of the *cause* which produces ascites occasions important varieties in the character of the effusion. Thus the colour may be dark brown, as in cirrhosis of the liver, or perfectly clear, as in chronic fatty degeneration of the kidneys. Between these extremes of colour all possible degrees exist. The quantity of solid constituents and the amount of albumen are from 1 to 5 per cent, and appear to increase with the length of time the effusion has existed. It would seem from the investigations of the observers (Hoppe-Seyler and Schmidt) that in primitive ascites the process is not one of simple filtration of serum out of the blood-vessels,—"that in fact the composition of the blood and the pressure in the venous radicles are not the sole determining factors. Some part in the formation and composition of the transudation must be ascribed to the endothelium and to the lymphatic vessels, although the exact *modus operandi* is not determined."

Diagnosis.—Prominent and easily recognisable phenomena betoken the presence of œdema in the subcutaneous areolar tissue. The part so affected is swollen; the skin loses its natural colour; it becomes pale, and it may be tense and glazed. Pressure with the finger on the pale surface leaves an impress—*pitting*—which corresponds in duration with the pressure made and the extent of the œdema present. The *pitting* quickly disappears if the œdema is slight, but if considerable and of long standing, the skin loses its elasticity, and the process of obliteration of the pressure mark is slow.

Ascites is more difficult to recognise, and may be simulated by other abnormal conditions. Inspection, palpation, and percussion will, however, establish the diagnosis. For inspection shows that the abdomen is swollen and full. Palpation gives a sense of fluctuation apparent to the touch when the patient is laid on his back or sits upright and a hand is laid flat on one side of the abdominal wall, while a stroke is made with the other on the opposite side. The wave of the fluid is also seen visibly to cross with the impulse given. Percussion shows that, in the dorsal position owing to gravitation, there is absolute dulness at the flanks, while the centre gives a clear tympanitic note from the air-filled intestinal coils. Percussion will also reveal modifications of sound, in obedience to the same law, on the change of position of the patient; for if placed on one side, the fluid will gravitate to that, leaving the one uppermost free, which will yield, on percussion, clearness instead of the dulness got when it was undermost.

This varying percussion sound affords a diagnostic sign to distinguish ascites from ovarian tumour. For in ascites the percussion sound varies with every change of attitude on the patient's part; while in ovarian dropsy it does not, being limited to the side where the tumour is, and where the history of the case evinces it had its origin. Additional means for establishing a diagnosis will be afforded by the presence or absence of morbid changes in other organs, as heart, liver, or kidney.

It may be further remarked that tympanites due to various causes may be confounded with ascites; but the percussion sound in the former is always loud and pronounced, both in front and sides. To distinguish it from distension of the bladder or pregnancy, the history of the case and the application of the catheter in the one instance, and the stethoscope in the other, are sufficient.

Treatment.—Without entering specially into the treatment of the different kinds of dropsy, it is to be observed that there are obvious indications—

1. To remove the fluid; 2. If possible to prevent its re-

currence; and if neither the one nor the other is possible palliative measures are necessary.

Rest in the recumbent posture is of paramount importance, and the part in which is the greatest effusion must be elevated and supported. For this end raise the anasarcous limb and support the distended scrotum.

There are three great channels for getting rid of the effusion—the skin, the kidneys, and the intestines; and if the remedies employed to eliminate it by these organs fail, then tapping or puncturing must be had recourse to (F. 34*a*, 37*a*, 27).

DEGENERATION

This term is used in Pathology to express the condition in which a tissue or substance becomes replaced by some other tissue or substance less highly organised, different in composition, and more unfit for the performance of its original functions.

This change may be effected by chemical metamorphosis, as of albuminous into FATTY material; by infiltration of the tissues with some new material, as AMYLOID; or by the substitution of a newly-formed tissue, inferior to the original in organisation or efficiency, as in FIBROID degeneration.

The following kinds of Degeneration are recognised by Pathologists:—Amyloid, Fatty, Mucoid or Colloid, Parenchymatous, Calcareous, Pigmentary, Fibroid and Necrotic.

1. AMYLOID (*Synonym*, Waxy, Lardaceous, Albuminoid Degeneration).—This degeneration is associated with exhausting diseases, where purulent discharges, long continued, weaken the strength of the patient; or where a former disease has deteriorated the constitution, as syphilis or ague; or some more obscure cachectic condition.

The organs affected are chiefly the liver, spleen, and kidneys, lymphatic glands, intestinal mucous membrane, especially the villi; more rarely the suprarenal bodies, pancreas; exceptionally the thyroid body and generative organs.

The organs affected are generally increased in size, and in advanced cases present a peculiar blanched appearance, like beeswax. If the tincture of iodine is applied to organs with albuminoid disease, a brown-yellow or mahogany colour is the result. A further change is occasioned if the iodine-discoloured parts are treated with dilute sulphuric acid—then a purplish-black colour forms. These changes are due to the existence in the tissue elements of a peculiar substance allied to the albuminates, and containing, when approximately pure, about 15 per cent of nitrogen. Virchow erroneously considered the change, from its characteristic colour when acted upon by iodine, as due to starch; hence the term "Amyloid," still retained in Pathology.

The general symptoms of amyloid disease during life are failing health, waxy appearance of the face, general debility.

In the case of the liver there is detected uniform smooth enlargement; and in the kidney the albuminuria and dropsy are of so peculiar a character as to distinguish this form from other chronic diseases of the organ.

2. Fatty Degeneration.—In fatty degeneration the organ is usually increased in size; the consistence is reduced, sometimes, as in the brain, to a pulpy state—the colour being changed to a yellow or buffy hue. When cut into, a greasy stain is left on the knife, and in advanced cases, as in liver disease, a portion of the organ thrown into water will float.

The microscopical characters of this degeneration, as seen in the heart and walls of capillaries, are first loss of sharpness of individual muscular striæ, and the appearance of minute quantities of oil formed within the elements. When the process is advanced the whole of the fleshy substance is replaced by fatty particles, contained in albuminous envelopes. Finally the degenerated fibres become atrophied through absorption of the fat; or suffer rupture, with discharge of their contents. Fatty degeneration is to be distinguished from fatty infiltration. The latter means the production of oil in the interior of a cell from materials furnished from without; while the former implies the death of a cell, or fibres so affected, and its transformation into oil. Change is thus dependent on interference with nutrition, and especially with the process of oxidation.

In "white softenings" of nervous tissue the nerve-cells and the nuclei of the part are converted into granular corpuscles; and when these break down into a fatty condition a creamy consistence is assumed.

3. COLLOID OR MUCOID DEGENERATION.—This degeneration is associated with a peculiar morbid product resembling glue or jelly, and is observed in some forms of cancer or new growths.

4. PARENCHYMATOUS OR GRANULAR DEGENERATION, also called CLOUDY SWELLING, is a peculiar change met with in some epithelial structures, especially the liver and kidney cells, and occurring in connection with some diseases of organs in pneumonia, typhus, typhoid fever, scarlet fever, diphtheria, and pyæmia. The naked-eye appearance is like that of fatty degeneration, but microscopically it is found that the cells are distended and their outlines obscured by the precipitation of a finely granular albumen, which is distinguished from fatty degeneration in that the particles are *soluble in acetic acid and insoluble in ether*. This degeneration is supposed by some authorities to be due to the high temperature observed in the diseases mentioned.

5. CALCAREOUS DEGENERATION.—This degeneration partakes more of the nature of an infiltration than degeneration, for the tissues are infiltrated with the deposition of calcareous particles. Sometimes the calcareous particles are deposited in what appears to be normal tissue, but as a rule there has been some antecedent degeneration; thus atheromatous patches are frequently the seat of calcareous degeneration.

6. PIGMENTARY DEGENERATION.—This is observed in the pigmentation of the spleen after intermittent fever, and it is also seen in chronic venous congestion following a fibroid degeneration.

7. FIBROID DEGENERATION.—This may follow chronic interstitial inflammation, as the result of which the original

tissue is replaced by a form of connective tissue. It is first observed that cells of a lymphoid type penetrate the tissue and become slowly organised. This ultimately leads to induration, contraction, and partial atrophy. Fibroid degeneration is further referred to under Diseases of the Lungs.

8. Necrosis—Gangrene.—By these terms is meant death of a part of the body. It is either due to the direct action of some injurious agent on the living tissues, or to interference with the normal blood-supply to the part, the result of weakness of the heart's action, or obstruction of an artery, as by an Embolus.

Dry Gangrene (Mummification) results when there is little moisture in the part; it is mostly due to obstruction, and is characteristic of senile gangrene.

Moist Gangrene or Sloughing is seen when the death of tissue is the result of mechanical injury or of inflammation; it is usually associated with putrefactive changes.

BACTERIOLOGY

Micro-organisms

It is now held that many diseases are due to microbes. In the case of some diseases, as diphtheria, such a connection has been definitely proved; in others, as in scarlet fever, we have not yet been able to identify the microbe. Microbes are minute unicellular organisms related to the algæ. They multiply very rapidly by fission, and in some cases by spore-formation. For their nourishment and growth microbes require the presence of organic material. Some can, however, grow on inorganic solutions, especially if they contain nitrates. Besides suitable nourishment microbes require for their proper growth certain other conditions of temperature, presence, or, in some cases, absence of oxygen, etc. During their growth microbes can affect the media in which they grow in various ways. Thus they may liquefy solid media, form gas, pigments, or they may produce various poisonous substances. Of these the poisons are the most important.

Some of these are nitrogenous bodies, basic in character, resembling the vegetable alkaloids. These basic bodies have been termed ptomaines. Examples are cadaverin and neurin. Besides ptomaines, highly poisonous bodies, not basic in nature, are formed. They are not proteid. To this indefinite class the name of toxin has been given. In most cases microbes seem to cause disease by means of the toxins which they elaborate. It has been found that the symptoms produced by injecting the toxin are the same as those produced by injecting the microbes themselves. It is indeed only in this way that we can explain how in some diseases, as diphtheria, tetanus, the microbes may remain strictly localised at the surface of the body, and yet produce general symptoms affecting the whole body. Again, some microbes have the power of acting as ferments, or of producing ferments, and in this way we may explain the rapid destruction of tissue in the intestinal lesions of cholera. To produce disease, then, microbes must be in the position to produce poisons which must get into the system.

The individual has various means of protecting himself against such inroads. It is found that certain races are naturally more able to resist some diseases: the negro is much less susceptible to yellow fever than the European. It is a matter of everyday experience how individuals differ in their relative susceptibility. Some people never develop a disease though constantly exposed to infection, while in others the slightest exposure leads to the disease. Experiments on animals show that various states affect this power of resistance. A dose of poison which one rabbit could survive would prove fatal in another rabbit if it had been weakened by fatigue, starvation, or exhaustion. The blood has a certain power of destroying microbes injected into it. This power is, however, limited and not sufficient to explain immunity. An infectious disease may be probably correctly defined as one caused by invasion and propagation inside the body of pathogenic (disease-producing) micro-organisms. Immunity is the power the individual has of resisting infection. Such immunity is of two kinds. It may be a natural property which never allows the individual to suffer from the disease, or it may be acquired in various ways. Thus one attack of scarlet fever confers on the individual immunity against another attack. Immunity against poison can be obtained by commencing with a very small dose and gradually increasing it. By thus accustoming the system, very large doses, which would otherwise prove fatal, may be survived. Metschnikoff discovered that in addition to the bactericidal action of the blood serum the leucocytes and fixed tissue cells were also inimical to the bacteria. These cells, called by him phagocytes, are seen to take up the bacteria inside them and gradually digest them. It was found that increase of phagocytes was caused by the introduction of virus, and that these phagocytes promptly englobed and digested the bacteria. In an animal which has acquired immunity the assemblage of phagocytes is more rapid and numerous than in an animal of the same species which is not immune. Acquired immunity would thus seem to be due to the phagocytes being in a better state of preparation and mobilising at the point of attack more rapidly than in non-immune animals. The blood serum of an animal which has been rendered immune has the power of conferring immunity on another animal on being injected into it. Thus a rabbit is rendered immune against diphtheria toxin. The dose of toxin sufficient to kill rabbits not rendered immune was then determined. It was found that this lethal dose, if mixed with a certain amount of serum from the immune animal, might be injected into rabbits without killing them. Similarly the toxin might be injected first and the serum later on, or *vice versa*, without destroying the animal. Evidently something in the serum acts as an antidote to the toxin. To this substance the name of antitoxin has been given. To explain how the antitoxin and the toxin neutralise each other, two theories are advanced. According to the generally accepted one, the process is analogous to the physiological neutralisation of strychnine by chloral hydrate. The other theory, which the most recent investigations seem to support, holds that the process is essentially chemical, the two neutralising each other as an acid neutralises an alkali. Recently much attention has been paid to antitoxins and the production of artificial immunity. In diphtheria it has been proved that injection of the antitoxin found in serum of an immune horse is of great therapeutical use. Haffkine has shown that temporary immunity against Asiatic plague may be acquired by injecting his antitoxin.

To recapitulate: The cause of many infectious diseases seems as follows:—Owing to some lowering of the power of resistance the microbes gain a lodgment in the tissues, multiply, and produce toxins which are absorbed and act on certain cells there and cause phagocytosis. At the same time they stimulate the cells to the formation of an antitoxin. When sufficient antitoxin has been formed to neutralise the toxins the disease stops. It is not necessary to kill the bacteria. Whenever the production of antitoxin exceeds the production of toxin the symptoms cease. We could thus explain the crisis in pneumonia as due to the neutralisation of the toxins.

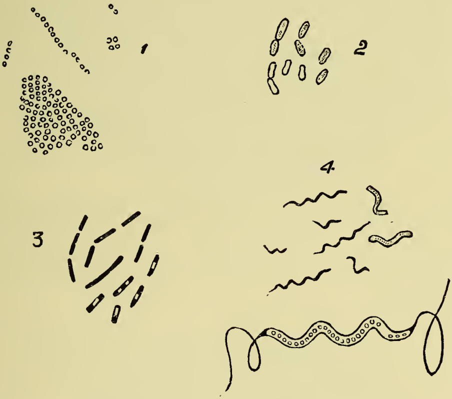

Fig. 4.

1. Micrococci. 2. Bacteria. 3. Bacilli. 4. Spirilla.

Micro-organisms are usually classified as rod-shaped bacilli, oval or round micrococci, and the spiral spirillum.

To determine whether any given organism is the cause of a disease, the following are the chief points necessary for proof:—

(*a*) That a definite form of organism must always be found in the blood or lymph or in the affected parts of the animal body.

(*b*) The micro-organism must be isolated from the blood, lymph, or tissues, and be cultivated in suitable media outside the animal body. These pure cultivations must be carried on through successive generations of the organism.

(*c*) A pure cultivation thus obtained must, when introduced into the body of a healthy animal of the same species, produce the same disease.

(*d*) In the inoculated animal the same micro-organism must be found.

INFLAMMATION

The old definition of inflammation by Celsus was thus expressed—

"Notæ Inflammationis sunt quatuor, rubor et tumor, cum calore et dolore."

These are the cardinal signs, but they do not explain the causes. The simplest definition of inflammation which at present it is possible to give is, that it is the expression of the reaction of the tissues of the body to organic or physical irritants. Tissue change thus underlies inflammation, and whence is this tissue change? The answer to this question is best solved by looking at what occurs when inflammation is set up in a part which can be carefully and microscopically examined during the inflammatory process. Thus, if the mesentery or the tongue of a frog is drawn out and placed under the microscope, inflammation occurs, and the tissue element may for hours be under observation.

What is then seen as the earliest change is dilatation, first of the arteries, then of the veins, the capillaries being little affected.

This dilatation is associated with quickening of the blood-stream, which lasts for a varying time, and is followed by retardation. The blood-current becomes slower and slower,

PLATE I.

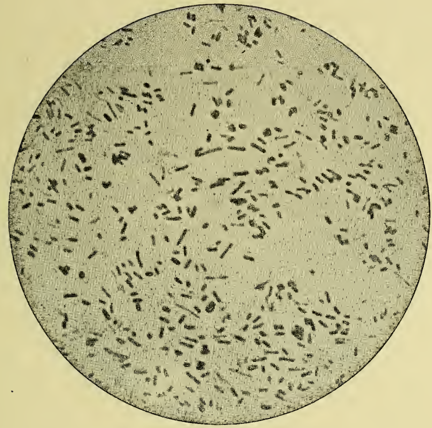

Fig. A.—Bacillus Typhosus. Cover-glass Preparation. × 1000. (Hewlett.)

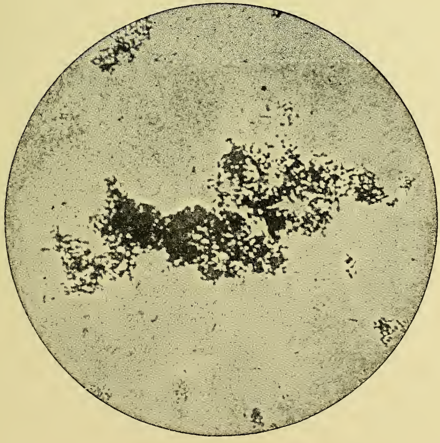

Fig. B.—Widal's Reaction. A Clump of Bacilli. (Before the addition of the serum the typhoid bacilli were quite isolated.) × 350. (Hewlett.)

PLATE II.

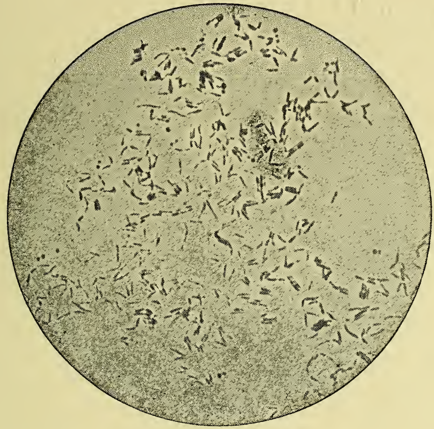

Fig. A.—Klebs-Löffler Bacillus. × 1000.
(Hewlett.)

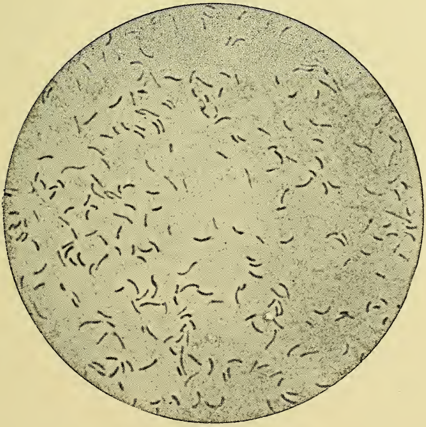

Fig. B.—Koch's Spirillum of Cholera. × 1000.
(Hewlett.)

PLATE III.

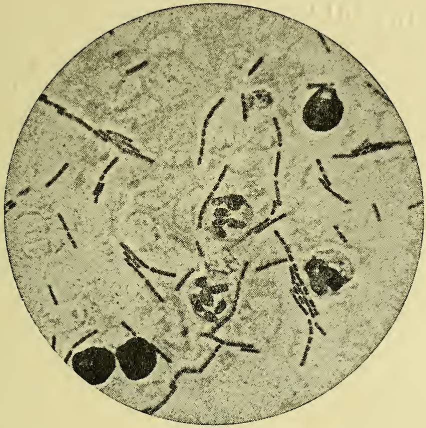

Fig. A.—Anthrax. Cover-glass Preparation of Blood of Inoculated Guinea-pig. × 750. (Hewlett.)

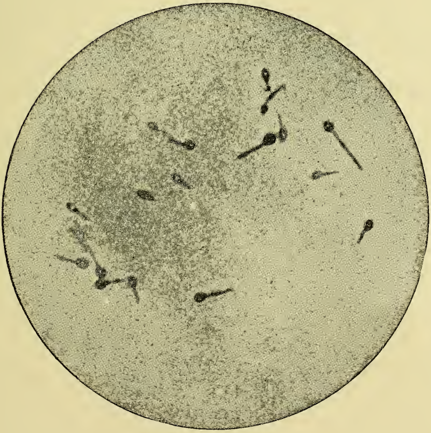

Fig. B.—Tetanus Bacillus. Cover-glass Preparation. × 1000. (Hewlett.)

and at last the stage of Stasis is reached, and remarkable phenomena are now seen in the circulation, especially of the veins. The red corpuscles and leucocytes in non-inflammatory conditions move on together in the blood-current, occupying a central position. But in inflammation the leucocytes lag in their course. They attach themselves to the margin of the vessel, and form a marginal layer. But this is not all; as stasis becomes more developed the phenomenon of *emigration* of the leucocytes is seen — that is to say, they pass through the vessel wall to the spaces outside. Their passage through the cement substance of the endothelium is observed as a small projection, which gradually enlarges until it becomes attached to the vessel wall by a narrow stem which becomes finally broken. It has usually been supposed that the emigration is due to pressure of the blood, aided by the changes which the inflammatory process causes in the walls of the vessels; but the observations of Metschnikoff strongly support the supposition that the pathogenic organisms outside the vessels attract the leucocytes, and thus induce emigration.

Soon after the leucocytes have begun to emigrate, *red blood corpuscles* also escape from the vessels in greater or less abundance, and their passage is passive and termed *diapedesis.* There is also an exudate of serum, the quantity of which varies.

In process of time the outer surface of veins and capillaries but not of arteries shows several rows of leucocytes, which evince that emigration is not solitary but in numbers.

The emigration of the leucocytes to their new quarters is, however, only preparatory to the exercise of *defensive* qualities. They arrange and group themselves in the tissues they have invaded, and in this they are to a certain extent aided by the fixed cells of the tissues which germinate and produce fresh elements. Many of the leucocytes, and possibly also some of the cells derived from the fixed corpuscles, then engage in a warfare with the irritating foreign bodies or organisms. If the latter are not excessively virulent, many of the leucocytes englobe them (and carry them off). This is called *phagocytosis.* On the other hand, extremely virulent organisms repel the leucocytes, and the inflammation ends disastrously. In addition to the leucocytes the exuded serum is supposed to exert a deleterious action on the offending substances.

The results of the exudation products are SERUM, MUCUS, FIBRIN, which by combination with leucocytes form lymph and pus. When inflammation becomes chronic, new growth takes place from the vessels in the form of vascular connective tissue, which in some cases assumes the special form of GRANULATIONS.

The exudations poured out, as the result of the inflammatory process, on serous and mucous membranes, differ in their terminations. In serous membranes they always coagulate. In mucous membranes they do not, as a rule, and probably this is due to some action of the epithelium; when, however, the epithelium is removed, a fibrinous layer follows, and the same result ensues from the application of a powerful irritant, as in croupous inflammation.

The inflammatory exudation, when the corpuscles greatly predominate, and the intermediate substance is liquid, is termed PUS.

The corpuscles of pus, fresh and newly formed, cannot be distinguished from leucocytes of the blood, for they exhibit active wandering (amœboid) movement, and continual change of form. When they develop in any quantity and accumulate and form an abscess, their wandering movements cease; they become dead.

In the formation of the abscess it is presumed that the tissue cells take an active part. The difference of tissues in which inflammation exists gives rise to various kinds of inflammation, to which distinctive names are given. Thus—

1. Catarrhal. On mucous membrane the exudation is not coagulable. It contains only detached epithelial cells and a few leucocytes.

If, however, catarrhal inflammation is very severe, it becomes purulent, as in the specific inflammation seen in virulent conjunctivitis and gonorrhœa.

2. Croupous or Fibrinous. Croupous inflammation is that form in which coagulable exudation is formed upon a mucous surface. Diphtheritic inflammation is more than this, for it expresses some death of mucous membrane, as well as exudation on the surface.

The fibrinous form may be regarded as the usual kind of inflammation of serous membranes and connective tissue; and the term "croupous" is applied to certain inflammations, as in the lung, *e.g.* "Croupous Pneumonia."

3. Parenchymatous. This name has been given to the inflammations occurring in special tissues of organs independent of connective tissue framework.

4. The inflammation of connective tissue framework is termed "INTERSTITIAL."

5. Infective inflammations are derived from pre-existing inflammations from which infective materials are carried by the blood. Pyæmia is a type of infective inflammation.

6. Chronic. Inflammations are termed chronic when they do not tend to resolve, but remain stationary.

Chronic inflammations on mucous surfaces are distinguished by the persistence of a condition in the vessels which permits exudation and cell-formation. In serous membranes chronic inflammations produce fibrous adhesions with little or no liquid exudation. In chronic interstitial inflammation of solid organs there is new formation and increase in bulk of the connective tissue, which subsequently contracts, causing atrophy of the parenchymatous elements and diminution of size of the organ. This is the condition observed in cirrhosis of the liver and in chronic interstitial inflammation of the kidney.

SPECIFIC INFECTIOUS DISEASES

FEVERS

We now take up the first great class of diseases—viz. Fevers, of which Graves says: "In the whole range of human maladies there is no disease of such surpassing interest and importance as fever." The knowledge of fever in the abstract is essential for the proper treatment of all diseases, and hence it is, doubtless, that the literature of fever is so varied and voluminous.

The old physicians said—"Essentia vero febrium est præter naturam caliditas." And they were led to this definition by feeling the skin, which they recognised to be warm—warm above the natural temperature of the body—warm above what is consistent with health. In late years we have been enabled to estimate more accurately than they did this increased warmth, by means of the clinical thermometer, which may be placed in the rectum, vagina, mouth, or axilla. For obvious reasons the latter is the site generally chosen. If the bulb of the thermometer is placed in the axilla, and kept there from ten to fifteen minutes, it will be found in health to register 98·6° F., or if it is placed in the rectum or vagina, it may rise to 99° F., or even a little higher. Certain circumstances may occasion a variation from the points mentioned, and yet health may be retained. What circumstances are these? 1*st*, Long exposure to great heat or cold. 2*nd*, Climate. The average temperature in tropical climates is greater than in temperate; *e.g.* it may reach 99·5° or even 100° F. 3*rd*, Food and drink. After a full meal the temperature first falls, then it increases as digestion goes on. Fasting lowers the temperature, and the taking of alcohol first causes a fall which does not last long, for it requires a considerable amount to have any material influence. 4*th*, Exercise also increases, while prolonged study causes a slight depression.

Aware of the existence of these circumstances, and bearing them in mind, the student may confidently assume that if these conditions do not exist, and yet the temperature remains persistently above normal, he has then undoubtedly to do with the state called Fever. It must be remembered, however, that increase of temperature is associated with many of the acute affections subsequently to be considered; and the student must not *ipso facto*, from mere thermometrical indications, and without carefully weighing probabilities, consider that he has to do with one or other of the specific fevers. In fever, as in all acute diseases, the temperature should be carefully taken *at least* twice daily, and in hospital a chart, containing the daily result from the commencement, should be hung up in a convenient situation near the bed.

Range of Temperature.—We think it advisable here to insert certain terms in general use to denote the different degrees of temperature above or below normal.

Collapse temperature	92·3° or lower to 96°.
Subnormal ,,	96° to 97·5°.
Normal ,,	97·5° to 99°.
Slight or moderate pyrexia	from 99° to 101° in the morning, or 102·5° in the evening.
Severe pyrexia	from 101° to 103° in the morning, or 105° in the evening.
Hyperpyrexia	above 105°.

Nature of Fever.—Virchow defined fever to be "a state of the body in which there is an increase of temperature above the normal." This definition, short and forcible, does not attempt to give any explanation of the cause of this increase. On this point there is still much uncertainty, but the statement is generally accepted that the normal temperature of the body depends first upon heat-production (or Thermogenesis), chiefly occurring in the muscles, and secondly upon heat-loss (or Thermolysis), which occurs chiefly from the skin and to a lesser extent by the lungs and fæces. The heat-production is controlled by nerves arising from centres in or near the corpus striatum, and the heat-loss is also under the control of the nerve apparatus of the central nervous system in the medulla oblongata. There is a great probability, further, that there is a part of the cerebrum whose function it is to maintain the balance between the heat-production and the heat-loss (Thermotaxis), and for this there are probably centres in the cortex of the brain. Heat-regulation, heat-production, and heat-loss may one or all be disturbed in fever, and it may be fairly assumed from our present bacteriological knowledge that poisons from the micro-organisms of specific fevers enter the blood and affect nervous centres, or fever may spring from disease operating directly on these centres. These two suppositions are supported by the facts, that discharges from wounds—the results of surgical operations—may be absorbed into the system and induce fever, while injuries to the nervous centres—the results of blows or falls—may cause an increase of temperature even without external wounds.

Treatment.—The treatment of fever will be considered afterwards under each disease in which it manifests itself. Still, speaking generally, here we may state that treatment is symptomatic unless we know, as in a specific infectious disease, the factor on which it depends. Then our efforts should be obviously directed to minimise its multiplication in the system.

Under certain conditions, when the fever is hyperpyretic, or is out of proportion to the normal course of the disease, we can employ antipyretics to curb the increased activity of the heat centre in the brain, as antipyrin, antifebrin, or phenacetin; or we can act upon the surface of the body by the cool or cold bath, or by cold sponging (p. 38).

In the treatment of ague quinine acts as a specific remedy; so also does salicin or the salicylate of sodium in acute rheumatism, the fever in each case subsiding with the disease.

In the early stage of the fever of catarrh or of local inflammation, the administration of tincture of aconite, by its action as a cardiac depressant, in minim doses every five minutes until 30 minims have been given, is attended with marked benefit.

Simple Fever or Febricula is non-contagious, and depends frequently on errors of diet, exposure to the sun or cold, or other insanitary agencies which may fatigue or weaken the system.

Symptoms.—Following on one or more of these causes, almost without any warning, the patient becomes languid and disinclined for either mental or bodily work; the appetite is lost, and headache ensues; a dull aching pain is felt all over the body, especially at the back, accompanied with "a creepy cold sensation" difficult to define.

This creepy cold sensation is followed, in the course generally of a few hours, by increased heat of body (fever), rapid pulse, 120 or 130 in the minute, furred tongue, and scanty, high-coloured urine. Delirium through sleeplessness may supervene, and the state of matters may seem very alarming, when, after an interval of three or four days, there is a crisis. The pulse falls, the skin becomes moist, thirst abates, headache ceases, not infrequently an herpetic eruption is observed on the lips, and a copious perspiration terminates the fever. The patient is left weak, yet convalescent, and the strength gradually returns.

Diagnosis.—By exclusion of other specific fevers as the cause of the rise of temperature, no vomiting, no pain of back as in small-pox; no sore throat as in scarlatina; no sneezing or cough as in measles. Stethoscopic examination does not reveal anything wrong with the chest, and thus a detectable pneumonia is excluded. Sudden onset excludes typhoid, and if no epidemic of typhus or relapsing exists, these fevers also are absent. It may be added that its division into "catarrhal," "bilious," "mesenteric," and "brain fever" seems unnecessary.

Treatment.—The indications for treatment, since the fever terminates in recovery, may be summed up in a few words. At the commencement give a saline purgative of sulphate of sodium and sulphate of magnesium, or a seidlitz powder. After the bowels have acted, employ a diaphoretic or diuretic mixture; or 1 minim doses of tincture of aconite may be given every five minutes in water until 30 minims have been administered (F. 31, 40). A tepid bath, or placing the feet in mustard and hot water, may hasten the crisis of simple febricula. The patient has no inclination for solid food, and should not be urged to take anything but a sloppy diet, as arrowroot, milk-gruel, etc. Convalescence is to be assisted by nourishing food, such as beef-tea, chicken-soup, and wine. A tonic mixture is also serviceable (F. 75, 76, 77).

To understand properly what is to follow, it may not be out of place to give a short historical account of the two great continued fevers of this country—*typhus* and *typhoid.* Formerly the word "typhus" included a group of diseases, but as morbid anatomy became more studied, it was attempted to explain typhus by an anatomical definition. This was especially the case in France at the beginning of the present century; it being found that cases like typhus presented characteristic lesions in the ileum and mesenteric glands. It was therefore supposed that all cases of typhus would show these characteristic lesions, and much disappointment ensued when it was discovered that there were instances of typhus which a post-mortem examination failed to explain. So, gradually, French and English physicians were reluctantly compelled to admit that the cases seen must belong to different categories. And hence it became necessary to use the term Typhoid ("like typhus"), and although objections may be urged against its employment, since the diseases differ so materially in their symptoms, progress, and terminations, yet it is doubtful if a better one can be established without being open to grave theoretical objections. For its synonym, "enteric," conveys the impression that the inflammation of the intestine is the cause of the fever, whereas in point of fact it is the result. So also "pythogenic," as applied by Dr. Murchison, implies that putrefactive changes, simply as putrefactive changes, can produce the fever—a conclusion which many deny.

Although the controversy which so long raged has now been practically settled, it seems impossible to doubt that these fevers presented distinctive characters from the earliest ages, although their anatomical differences and clinical history were only elucidated in recent years. For it can scarcely be supposed that typhoid did not exist as well as typhus long ago. Its non-detection was probably due to the looseness and the carelessness displayed in recording the results of pathological observations. All intestinal ulcers were at one time classified under the term Dysentery, and very probably typhoid epidemics were simply treated and styled dysenteric epidemics. In the seventeenth century, descriptions of cases, with accounts of post-mortem examinations, leave little doubt that typhoid fever was then widely spread in Europe. Such reports were given by Spigelius in Italy; by Willis and Sydenham in England; by Hoffmann in Germany. In the eighteenth century its existence can be proved with certainty, for Morgagni describes a case with ulcers and perforations in the ileum and beginning of the colon, with swelling of the mesenteric glands and of the spleen. So, also, other cases were reported with more or less minuteness, until, at the beginning of the present century, the French described epidemics of typhoid fever with constant intestinal lesions.

It was reserved for Bretonneau of Tours, in 1820, to prove that the disease was always localised in the solitary and agminated glands of the ileum. He also was the first to maintain that it depended on the action of a poison, which was communicated from the sick to the healthy; and, carried away by the discovery, he and subsequent French observers deemed it identical with the contagious typhus seen in camps and following armies. Then there came to be a wide division in the views of French and English pathologists—the former rarely failing to find the intestines diseased in continued fever, while the latter saw them healthy, and regarded the intestinal lesion as a mere accidental complication. So the controversy raged for some years, and it appeared puzzling to candid inquirers how eminent and truthful observers should record such seemingly discordant facts.

For it would appear clear, either that the intestine was diseased, or that it was not. It was or it was not the seat of ulceration. In 1835 Dr. Perry of Glasgow very nearly guessed the whole truth that the fevers were essentially distinct, though he admitted that the one might pass into the other. He was followed by Dr. Lombard of Geneva, and Messrs. Gerhard and Peacock of Philadelphia, who stated that "the distinctive characters of the two diseases were such as in practice could not allow them to be confounded." In 1841 Louis, in his great work on typhoid fever, admitted that "the typhus fever of the English is one very different from the one he is now describing—viz. typhoid." Notwithstanding this, the doctrine of non-identity did not remain unopposed, for different schools propounded different doctrines.

Much of the remaining doubt was, however, dispelled by the researches of Sir W. Jenner, published between 1849 and 1851. Not merely did he state the differences observed during life, but by an analysis of carefully recorded cases he showed the distinctive post-mortem features of typhoid. He also demonstrated that the two fevers were dependent on different causes, that the one did not communicate the other, and finally concluded by stating that "typhus and the so-called typhoid fever were as distinct as any of the exanthemata"—an opinion which all subsequent observations have tended to confirm.

After these remarks we now take up the separate consideration of the different fevers, commencing with—

TYPHUS FEVER

This fever was, as has been indicated, formerly called putrid, pestilential, ship, or hospital fever, and it derives its name from the Greek word τῦφος, smoke. This fever is contagious, usually epidemic, and most frequently follows, or is the direct result of, destitution, overcrowding, and bad ventilation. It is eminently a disease of the poor; highly contagious; bedding and clothes retain the poison for a long time. Under better sanitary arrangements, and timely removal of cases to a fever hospital, typhus fever does not now assume an epidemic form in our large towns.

Symptoms and Course.—The incubation of typhus fever is of variable length, but usually it is from one to twelve days or even longer; during which time the health generally appears to be perfect. The onset of the disease is sudden, and is attended with frontal headache and pains in the back and limbs. The patient feels chilly or may even shiver, and is disinclined for any exertion. The tongue is furred and white, and the bowels are constipated. Prostration increases, and by the third or fourth day he gives in and takes to his bed.

Mulberry Rash.—The eruption in typhus fever appears on from the fifth to the seventh day, and reaches the maximum amount in a day or two. It occupies the trunk and the extremities, and occasionally the face. It consists of *distinct spots* and a *subcuticular rash.* The *Spots* on their first appearance are slightly elevated, somewhat flattened, have a dusky pinkish-red colour somewhat like the stains of mulberry juice, and disappear completely on pressure, resuming their distinctive appearances as the finger is being withdrawn. Their size varies from a mere point to two, three, or four lines in diameter. In a period of from one to three days these spots undergo a marked change: they are no longer elevated above the level of the cuticle; their hue grows darker and more dingy; and instead of disappearing under pressure they only fade. In many cases, especially those that are severe, their centres become dark purple and are unaltered in appearance by the firmest pressure; frequently entire spots, circumference as well as centre, change into *petechiæ.* Petechial spots on the backs of the hands are of great significance as pointing to typhus fever.

The Subcuticular Rash.—When the trunk is covered with the mulberry rash, many of the spots are usually pale, very imperfectly marked as spots, and run into each other; these spots are seen indistinctly as if seated beneath the cuticle; they are "not well out." They give to the skin a mottled aspect, and on this mottled surface, as on a ground, the darker, more distinct, and decidedly marked spots are situated.

The subcuticular rash may precede or be preceded for a day or two by the distinct spots. The rash comes out *once for all* (not gradually) from the fifth to the seventh day of the fever, and is rarely absent in adults, although in young children it is not so constantly observed. In addition to this rash characteristic of typhus fever, there is also peculiar to it a dull, heavy, stupid expression of countenance. The eyelids droop, and the eyes have the appearance of those of a man recently recovered from a debauch.

With the fever there is generally delirium. This rarely comes on before the end of the first week, and usually continues until death or convalescence supervenes. The delirium may be of a violent and painful character, and at first is not continuous. The patient can be roused to answer questions, take drinks, or show his tongue. Yet his expression is vacant, and he mutters when alone. Generally this stage is succeeded by a loss of cognisance of external objects, by various delusions, especially during the night, and by increased delirium.

The temperature rises in the first week to 104° or 105°, remaining about these points for a week, and then on the twelfth day there is usually a decided fall and the crisis is completed by the fourteenth. The rate of the pulse varies little from day to day, but its general tendency is to become more rapid. Its volume and force decline, until in severe cases it is very feeble and even imperceptible. Preceding a fatal termination the temperature may rise to 108° or even

109°. Progressive weakness is noted by diminution or loss of the heart's impulse, with disappearance of the first sound. For several days, even when recovery is to take place, it is often impossible to feel the heart beating, and with the stethoscope only the second sound can be heard. Hypostatic congestion of the lungs occurs in all severe cases.

The tongue in the first week is very foul; in severe cases during the second week it becomes dry, brown, tremulous, and is protruded with difficulty, while the teeth and lips are covered with sordes, emaciation all the time going on, with tendency to contraction of the pupil, cold extremities, and congested conjunctivæ. In favourable cases the disease usually terminates on the fourteenth day from the commencement of the fever by a "crisis," which is ushered in by profuse sweating, a prolonged sleep, or diarrhœa; or more rarely there is no marked crisis, but rather a gradual subsidence of pulse and temperature ("a lysis").

Should a fatal termination ensue, it usually happens between the twelfth and the twentieth day of the fever, death being preceded by great prostration, hiccough, picking of the bedclothes, *subsultus tendinum*, involuntary passing of fæces and urine, and coma. Occasionally a day or two before death the condition termed *coma vigil* is observed. The patient then never sleeps. He lies on his back with his eyelids widely separated; his eyes staring and fixed on vacuity; his mouth partially open; his face pale and expressionless. He cannot be aroused to a sign of consciousness; the breathing is scarcely perceptible; the pulse rapid and feeble or imperceptible; the skin cool, perhaps bathed in perspiration. Life is only known to have ceased by the eye losing its slight lustre, and the chest ceasing its slow and feeble movements.

Morbid Anatomy.—There is nothing characteristic in the post-mortem appearances of a fatal case of typhus fever. If there has been marked delirium we may expect to find the cerebral sinuses engorged; but in the majority of cases the brain is unaltered. The heart may be somewhat atrophied, and the blood "dark and fluid." The liver is enlarged and soft, and may have a dull clay colour; the spleen is softened and in some cases enlarged; the kidneys are swollen; bronchial catarrh is usually, and hypostatic congestion of the lungs often, present. The intestinal tract is healthy.

Complications and Sequelæ.—Broncho-pneumonia is perhaps the most common complication, and may pass on to gangrene. Occasionally inflammatory swellings form in the carotid and submaxillary region, or in the joints, and go on rapidly to suppuration. A slough frequently forms, about the middle or end of the second week, on the lower end of the spine, or on the posterior spine of the ilium. Mania sometimes sets in during convalescence, but it is not as a rule permanent; and hemiplegia, with or without aphasia, is an occasional sequela.

Diagnosis.—When the disease occurs in an epidemic form the diagnosis is easy, but isolated cases may be very difficult to distinguish from typhoid fever. The main points in the diagnosis of typhus in the first days of the fever are its sudden onset, the greater frequency of the chill, the early prostration, and subsequently the characteristic rash coming out *once* for all. At its onset it may be mistaken for severe cerebro-spinal fever, but the diagnosis after a few days is usually clear.

Prognosis.—The mortality is about one in ten of those attacked, and the greater the age above ten years, the greater the danger.

Treatment.—In a case of typhus fever it is absolutely necessary that the patient should be isolated from other members of the household, or, better, that he should be removed to a fever hospital. In the early incubatory stage, Dr. Hughes Bennett recommended an emetic, which he said had saved him from one or two attacks, when he was certain the poison was in his system. If this stage be over, the treatment must be symptomatic. A purgative of thirty to sixty grains of rhubarb may be given at the outset. Tepid water injections relieve after-constipation. The apartment should, if possible, be large and well ventilated, with a fire in the room. Intercourse with friends should be restricted, and attendance limited to skilled nurses. The head should be shaved, or the hair teased out, and cold lotions applied. The diet should consist chiefly, but not necessarily solely, of milk and weak broth, given in small quantities every two or three hours, in all five to six pints of milk daily.

The pulmonary complications are frequently relieved by hot poultices covered with oiled silk and the internal use of ipecacuanha wine first, followed, if necessary, by carbonate of ammonium. If the symptoms subside, these remedies must not be continued, as their tendency is to weaken the patient.

The excessive thirst may be obviated by cool drinks in abundance—water, lemonade, carbonic acid water, particularly that which has been made with distilled water.

Cold sponging is both pleasant and useful. High authorities recommend cool baths at about 87° F., repeated day and night if the temperature rises above 103° F. They are said to be generally well borne, and meet with no opposition from the patient, as soon as a few have been taken. In employing them it is not to be supposed that the patient is to be carried into a bath-room and then moved back to bed, but that a full-sized bath is placed near to his bed, into which he is carefully lifted. A sheet is placed hammock-wise in the bath and secured; upon this he reposes, while a large oiled silk covering prevents undue exposure of the person.

To prevent Formation of Bed-sores.—Undue pressure should be avoided by pledgets of lint or cotton wool, secured by sticking-plaster over the points most exposed to pressure, or, better still, by placing the patient on a water-bed. If in spite of this a suspicious blush is observed when the coverings are removed, then rub up alum with white of egg and brandy, and apply it over the part, or wash the part night and morning and apply glycerin of alum. If through carelessness or ignorance they have formed, the slough may be removed by a charcoal poultice. Iodoform should then be dusted over the sore or sores.

General indications[1] with regard to the use of *stimulants* may be summarised as follows:—Do not be in haste to begin them, and do not assume that, once begun, it is necessary to continue them all through the fever. Few do well with stimulants at the beginning of the continued fevers; as a rule they do harm until after the end of the first week, but much will depend on the type. Be guided in giving them by the type of the fever and the particulars of each case. Remember that signal loss of strength, rapid feeble pulse, and weakness of the first sound of the heart, are indications for their employment. If after the first dose the fever is increased, the temperature rising higher, and if the patient becomes restless, withhold the stimulant. But if he shows less languor, if the delirium is diminished, if the pulse becomes fuller, if the tongue is moister, if sleep comes on, and if the patient is easily roused from slumber, and sensible when roused, alcohol is beneficial.

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[1] These indications with regard to alcohol are general, and not limited to fever, but apply also to acute inflammatory conditions.

The dose cannot be exactly regulated. You may begin with a dessertspoonful of brandy or whisky diluted, and, if well borne, this may be continued, as circumstances require, every two or three hours, commencing in the morning. If wine is preferred, remember that sherry is the most palatable, and that port is not better than other wine unless there is diarrhœa. A mixture of chloral and bromide of potassium is beneficial, especially at the approach of the crisis, if there is great irritability and sleeplessness (F. 69).

TYPHOID FEVER

The *bacillus* of typhoid fever has been noted by various observers. It is a small thick bacillus with rounded ends. It is very mobile, and possesses flagellæ. It grows on various media, as milk, drinking-water, etc. It may be introduced into the system by the use of contaminated food, as milk, water, oysters. The bacilli multiply in the intestine, and are abundantly present in the stools. Unless the infected stools are carefully disposed of, they may become the means of spreading the infection by contaminating the water-supply. According to Pettenkofer, the bacillus, as it leaves the body, is not infectious. He holds that it must undergo further changes before it becomes capable of causing infection. The liability to disease is markedly influenced by age, season, general debility, and errors of diet. Statistics evince that it specially affects both sexes from ten to thirty years, and that above and below these years it is comparatively rare. They also show that typhoid epidemics are most apt to develop when fruits, ripe or unripe, are principally taken, as during the months from August to November, while they are fewer from December to April. The term Typhoid means "like typhus," and the fever has also been named enteric, gastric, or pythogenic.

Symptoms and Course.—The patient is attacked by the disease more insidiously than in typhus. There is no abrupt departure from health to disease. There may be a slight premonitory chill, followed by *malaise* and inability or aversion to work. The man feels out of sorts, and attends listlessly to his business; the child inclines to rest, and not to play with its toys. Then lying in bed is found to be a welcome relief, and there is no inclination to leave it. At the early stage of typhoid, as well as during the whole continuance of the fever, the thermometer is found to be of great value. Thus, even although the pulse indicates little deviation from health, it may be found that the evening temperature is higher than the morning by about a degree—99·9° F. morning, 100·5° F. evening; and this characteristic of a high evening temperature compared with that of the morning is retained throughout the disease. The temperature rises gradually, and may reach 105° F. towards the end of the first week; in the second week the fever is continuous; in the third the fever begins gradually to fall; in the fourth the temperature usually becomes normal, but this varies, in some cases the pyrexia lasting for an indefinite time after the other symptoms have gone. The pulse averages from 90 to 110. When it keeps at 140 in adults it is always an unfavourable symptom. The pulse and temperature do not always correspond; for sometimes, although fever exists, the pulse may be normal or subnormal. Marked irregularity of the pulse, independent of mental excitement or slight bodily exertion, is always a grave symptom, though this irregularity may pass off and the patient recover. As regards *quality*, the pulse after some duration of the fever feels relaxed and soft, easily compressible, but during the first week it is full in volume and often dicrotic. This dicrotism or duplication of the pulse can be appreciated even by the finger, and when very detectable the nurse may count twice as many beats as there really are. The general symptoms of fever are present —as thirst, loss of appetite, and headache. The tongue loses the colour of health, and becomes small and dry, having a pale brownish-yellow fur, with red tip and edges.

About the seventh or eighth day of the fever small characteristic rose-coloured spots appear on the abdomen, chest, or limbs, being situated on normal uncoloured skin. They may be few in number or numerous, and are raised to the touch. Their form is circular, and they last about three days, disappearing completely under pressure, to reappear when that is removed. Fresh crops succeed those previously formed, perhaps until the termination of the fever. They are rarely seen after the thirtieth day unless, as not infrequently happens, a relapse occurs. The rose-coloured spots are not always present, and Murchison states that they are frequently absent in children.

The abdomen becomes somewhat enlarged, and on careful pressure over the right iliac fossa a gurgling sound is generally heard, with distinct wincing or even actual pain. Even when delirium is present this wincing is usually seen by looking at the face. The spleen is enlarged.

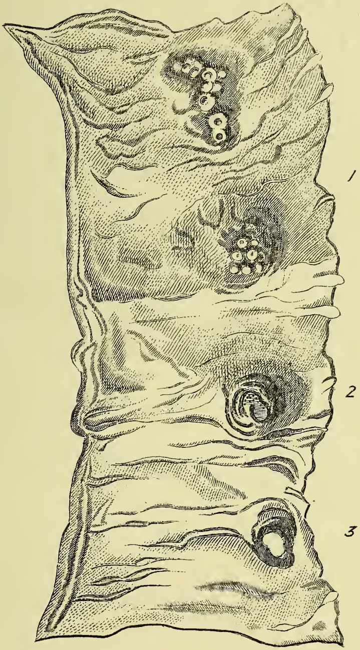
Diarrhœa may be present. In some cases the stools are numerous, in others only two or three in the day. The colour of the stools is characteristic, and best described as often like Pea-soup, but sometimes, especially in severe cases, representing chopped green vegetables in a watery fluid. Occasionally the stools contain blood, in quantity varying from a mere tinge to a pint or more. With diarrhœa there may be marked distension of the abdomen and tympanites. A moderate degree of bronchitis is present as a rule.

Course and Progress of the Disease.—In mild cases symptoms of amendment may appear in the middle of the *second week*, but in severe cases the temperature remains high, and in the beginning of the *third week* somnolence may supervene, sometimes interrupted by delirium. "This delirium is more acute and noisy than that of typhus, but it is not continuous, and during the intervals of delirium the patient may be rational and conscious, or more or less confused; or he lies motionless in bed with his eyelids closed, yet replies to questions, though the answers are inarticulate and unintelligible. Day by day the strength is lost, the tongue is dry and brown, the pulse feeble, the delirium low and muttering, tremors and involuntary evacuations occur. Death may now take place by coma, or improvement may begin from the end of the third week. In the majority of cases there is no delirium, but it is to be remembered that in such cases danger is not past from pulmonary complications, or from peritonitis consequent on perforation, or from the exhaustion of great diarrhœa or uncontrollable hæmorrhage," and during convalescence from bed-sores or thrombosis of the femoral vein, with the attendant liability to pulmonary embolism.

Morbid Anatomy.—There is no trace of the spots noted during life. The spleen is considerably enlarged and softened; the heart in one-third of the cases is soft and flabby; the lungs are either œdematous or congested; the liver often hyperæmic. The kidneys are generally healthy. The *essential* lesions are altered appearances of Peyer's patches, solitary follicles, and the adjacent mesenteric glands; and the lesions are most distinct in the groups of glands nearest the ileo-cæcal valve. In the earlier stages the Peyer's patches are congested and swollen, and may be found projecting above the level of the mucous membrane like buttons. The surface of these raised patches may later on be eroded and ulcerated, and portions of them may slough away, exposing the muscular and even the peritoneal layers. The ulcer has sharply-defined edges, and may vary in size and shape. Perforation of the thin floor of the ulcer is one cause of a fatal termination to the disease. The cicatrices left after these ulcers have healed commonly disappear after a few years. Ulceration of the mucous membrane of the large intestine, generally of the cæcum and colon adjacent, is present in about one-third of the cases. The mesenteric glands are invariably enlarged, reddened, and softened,—the size they may attain varies from a bean to a pigeon's egg.

Diagnosis.—In early stages it is distinguished from other

Pl.IV.



TYPHOID ULCERATION OF THE ILEUM.

1. SWELLING OF PEYER'S PATCHES.
2 & 3. ULCERATION & PERFORATION.

fevers by the absence of characteristic eruptions. By the fifth day of the illness, the rash of typhus, small-pox, or scarlet fever would have developed; whereas the appearance of rose spots a few days later confirms the suspicion of typhoid fever. A conclusion as to the existence of typhoid fever may thus be formulated. Any fever in this country lasting for a week with no rash and no evidence of local inflammatory mischief is either typhoid fever or meningitis. Meningitis is, however, a rare disease, typhoid fever is very common, and even when typhoid fever comes on in the early stage with severe headache and subsequent delirium, it is to be borne in mind that the headache is more severe in meningitis, and is usually accompanied at first by vomiting, irregularity of the temperature and the pulse, and later on by retracted abdomen, optic neuritis, squinting, or convulsion. The increase of abdominal symptoms, with the presence of spots and the absence of headache after the tenth day, determine for typhoid. The addition of blood serum of a typhoid patient to a freshly prepared culture of Eberth's bacillus causes the bacilli to rapidly lose their mobility and form clumps. This agglutination process is called Widal's reaction. It is of great diagnostic importance. The reaction can as a rule be obtained in the second week, and persists for an indefinite time.

Prognosis.—The mortality ranges from 5 to 20 per cent. Apart from complications, which always modify the prognosis, the intensity of the fever is an important guide. If the temperature is, although high at the end of the first week, subsequently never above 103°, the case is favourable; if the temperature is maintained at 104° or higher throughout the second week, it is much more dangerous. Hæmorrhage is not a favourable symptom; perforation is rarely recovered from; severe chest complications or a feeble irregular heart, or much abdominal distension, are all unfavourable.

Treatment.—The prophylactic treatment is of essential importance, for if the disease spreads from the dejecta of the fever patient, it is obvious that these should be carefully attended to, and not thrown without due precautions into privies or dunghills, whence they may contaminate the water or milk supply, and give rise to extensive epidemics. Accordingly, Liebermeister recommends the use of a porcelain bedpan, strewed each time before being used with a layer of sulphate of iron; and immediately after the stool has been passed, crude muriatic acid to be poured over the fæcal mass. If practicable, as in country districts, the contents of the bedpan should now be emptied into trenches removed from water-supply sources; and if in the town, where such a proceeding is impossible, thrown into the privy-vaults with a considerable quantity of the acid. Underclothing or bed-clothing soiled with the stools should be immersed in cold water to which a little chloride of zinc has been added, and then thoroughly boiled within twenty-four hours. Dr. Russell of Glasgow states that all washable articles should be disinfected by steam and simple washing, and the experience of Belvidere Fever Hospital shows, from statistics of ten years, that the process is efficient for destroying the chances of infection. Dr. Russell justly adds that "a sick-room cannot be made a scientific laboratory where everything infected can be submitted to chemical or antiseptic manipulation. Steam and plenty of water destroy infection, while they do not render articles acted on useless for the future."

In investigating an epidemic of typhoid fever it is desirable to trace it to its source, and thus it will be essential in many cases, through neglect or ignorance of the prophylactic measures mentioned, to shut up suspected wells, stop the milk supply from an infected dairy, and in each hygienic regulation guard against a panic by giving to the people an intelligent reason for the institution of the measures adopted.

"Attention to little things," as Sir William Jenner expresses it, is of paramount importance. Statistics prove that those patients who lay themselves up at its first approach, and do not attempt to fight against the disease, have by far the best chance of recovery. Thus, generally speaking, hospital experience testifies that of patients admitted at the end of the fourth day, 5 per cent die; between the fourth and eleventh, 13 per cent; after the eleventh, 28 per cent. Physical exertion, weariness, prolonged railway travelling, all movements, either on foot or horseback, or jolting in a carriage during the early and insidious progress of the fever, are to be carefully avoided.

The patient should be confined to bed on the first suspicious symptom, and should not be allowed to leave it until the evening temperature is normal during eighteen days. The possibility of a relapse occurring should never be lost sight of.

Dietetic Treatment.—The diet should consist of easily digested foods which do not form bulky fæces. Indeed, nature in fever craves for no strong aliment, but longs for something light or liquid, and experience testifies that the diet in continued fever should be milk, given at regular intervals, as half a cupful every two hours. In all, two to three pints should be taken in twenty-four hours. Peptonising milk injures the taste but little, and it markedly aids digestion. A pint of milk is equal in nutritive value to a mutton chop, hence overfeeding with milk is to be deprecated. When convalescence is reached the appetite becomes very strong, but the desire should in no circumstances be satisfied by solid food, for the newly-healed ulcers in the small intestines cannot bear any strain. It is only when the morning and evening temperatures reach the normal, and have remained normal for eight or ten days, that milk or fluid food may be supplemented by animal jellies, weak infusions of flesh, fish, and a very little roast mutton or chicken. Beef-tea, as ordinarily prepared, is little more than warm water flavoured with the meat from which it was made. As an article of diet in fever it should never be relied on, for it has little nutritive power, and has a tendency to aggravate diarrhœa. Tea is acceptable to patients, but it should not be given if it cause flatulence. It may be made nutritious by a large addition of milk. The soup prepared from mutton or chicken is more serviceable when to it is added the yolk or albumen of eggs. Soups also should be varied: thus, made from mutton one day and from chicken the next. Fever patients should not only be allowed to sip water as often as the desire prompts them to do so, but in cases where, from the blunt state of the perception, they manifest no desire for it, it should be systematically given by the nurse. Iced water, or aerated water in moderation, as too much of the latter may cause flatulence, is not objectionable;

and the liquid may be flavoured with lemon or orange juice, if it is thereby rendered more agreeable to the patient.

The student should remember as a summary of dietetic treatment in typhoid fever that milk is the best food; and that no solid food should be taken until the tongue is clean, all pain on pressure over the iliac region gone, and the temperature has remained normal for eight or ten days.

The nurse should see to the bed-pan being used, and on no account should the patient be allowed to go to stool, however slight the fever may be. All unnecessary exposure when the temperature is taken should be avoided; all business affairs, all communications likely to annoy, kept away from the sick-bed. Questions should be briefly and kindly answered, but conversation studiously interdicted. The temperature of the room should be kept about 64° F., not higher. Draughts must be prevented; and in private houses, if practicable, a window should always be kept open in the next room, and the door between the two rooms never closed.

The *medicinal* treatment of typhoid fever should be commenced by giving two or three doses of 3 or 4 grains of calomel. This cleans the bowel of toxic ptomaines and decomposing substances, and clears the way for the antiseptic treatment of the fever, which seems to be the most rational method. Various antiseptic remedies have been recommended, but to discuss their merits would be unprofitable and impossible.

My remarks will be confined to intestinal antisepsis by carbolic acid, liquor chlori with quinine, and carbonate of guaiacol.

1. Pure carbolic acid, which melts at a temperature of 40° C., can be obtained in the form of a pill ($1\frac{1}{2}$ grain, or $2\frac{1}{2}$ grains). These pills, prepared with finely-divided charcoal, and coated with keratin, do not split up in the acid secretion of the stomach, but slowly liberate their contents in the alkaline secretion of the intestinal canal, and thus, 1st, bathe the infected portion of the ileum with a wholesome antiseptic fluid; and 2nd, when in part absorbed, into the circulation exert an antipyretic action. Three or four of the $2\frac{1}{2}$-grain

pills, or six or eight of the 1½-grain pills,[1] should be given in the course of the day. The keratin coating may be found in the stools, but the contents are invariably absent. The beneficial action of salol is doubtless due to liberation of carbolic acid. Either way of giving the acid, especially in the first ten days of the fever, is effective and safe. Even in later stages, the pilular form tends to deodorise the fœtor of the stools, to control diarrhœa, and to promote cicatrisation of the ulcers (F. 22*a*).

2. To liquor chlori specially prepared (F. 91*a*) is added quinine, so that the dose of quinine in twenty-four hours will be from 12 to 36 grains.

3. Carbonate of guaiacol synthetically prepared is chemically pure. According to Holscher, it has an abortive action when given in 2½-grain doses thrice daily. When employed from the very commencement of the fever, the temperature rarely attains any great height. In other cases not seen at the commencement, it has a salutary effect upon the diarrhœa. It is not, like the other two remedies referred to, antipyretic, but simply an intestinal antiseptic, and, if the fever be high, should be combined with acetanilide.

If the fever be not seen in the early stage, and if consequently antiseptic treatment seems inadmissible, certain complications may require treatment, as severe diarrhœa, hæmorrhage, perforation, and high temperature.

Diarrhœa.—This requires no treatment unless the stools be above the normal of four in twenty-four hours. If above this normal number, diarrhœa depends upon, 1st, errors of diet, or 2nd, catarrhal inflammation. The stools should be carefully examined; possibly there may be curds of milk. If so, diminish the supply of milk, and if the stools are strongly alkaline, acid sulph. dil. sometimes gives marked relief. When the stools are merely frequent, an enema of 4 ounces of starch and water will often check frequent action. If this is not effectual, add to the enema 8 m. of tinct. opii, and inject this night and morning after the passage of the stool, or give after each stool pil. plumbi c. opio. If the odour be very offensive, a teaspoonful of finely bruised charcoal may be given two or three times in the day. If *catarrhal* inflammation be indicated, carbonate of bismuth in 20-grain doses every four or six hours is an excellent remedy. If diarrhœa be excessive, catechu, opium, and mist. cretæ should be given (F. 17). In the case of a child, opium by the mouth is forbidden, but 2 grains of pulv. ipecac. co., 5 grains of tannic acid, ℥ss. of gum acacia with 1℥ of water, may, without risk, be injected after each action of the bowels, or bismuth (F. 20).

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[1] These pills can be obtained from Mr. Macmillan, Pharmaceutical Chemist, Glasgow.

If the bowels be confined, a small enema of thin gruel is sufficient to cause a motion.

Hæmorrhage.—"If blood be detected in the stools, even in a very small quantity, the patient must lie perfectly still. He should not be allowed to sit on a bed-pan, or raise himself or be raised by others to pass urine. If unable to pass urine when in the recumbent position, the urine should be drawn off by a catheter. The bowels must be kept as empty as possible. No milk should be given, but essences of meat, etc., and iced water slowly sipped. Local applications of cold should be applied to the abdomen by means of the various india-rubber applications adapted for this purpose. The movements of the bowels should be restrained as far as possible and for as long as possible. To effect this, 15 grains of gallic acid with iced water, and 5 m. of tinct. opii, should be given by the mouth, or an enema of an ounce of starch and water with 15 m. of tinct. opii. The faintness due to considerable bleeding from the bowel should not be removed by stimulants unless it immediately threatens life." *Tympanites.*—If during the third week the tongue is dry and glazed, with some tympanites, then ol. terebinth m. x. should be given every two hours. In twenty-four to forty-eight hours improvement is manifested—the tongue covered with fur, the tympanites lessened. Under these circumstances, decrease the dose but do not stop it altogether. If tympanites be great, and the prostration extreme, the dose of turpentine should be increased to 60 m., and turpentine stupes should be applied to the abdomen. *Peritonitis,* if due to perforation, is best met with immediate laparotomy. In other cases opium may be given. *Nervous symptoms*, as delirium, insomnia, and restlessness, necessitate sedatives, as a combination of chloral and bromide of potassium (F. 69), and *chest complications*, as bronchitis, require small doses of expectorants.

High Temperature.—In America, and on the Continent, cold baths are largely used. Whenever the temperature keeps above 103° a tepid bath 70° to 90° F. is given every three hours. The bath lasts for about ten to fifteen minutes. This causes marked chilliness while in bath, and afterwards a considerable fall of temperature. The only contra-indications are peritonitis and hæmorrhage. The systematic use of baths is said to have markedly reduced the mortality. The bath causes clearing of the sensorium, acting as a general stimulant, and markedly stimulating respiration. It reduces fever and prevents formation of bed-sores. In practice we have usually to be content with cold sponging. As a rule the use of antipyretics, as phenacetin and antipyrin, is not advisable.

The *state* of the heart as indicated by the frequency of its beats and the strength of its impulse has always been considered of the greatest importance in determining the treatment to be adopted at any moment in a case of typhoid fever. As a rule the frequency of the pulse-beats varies inversely as their strength, and to avert death from asthenia, or from the enfeeblement producing local congestion, alcohol must be given in the quantity of 4, 6, or 8 ounces of brandy or whisky in the twenty-four hours. It is bad treatment to give 12 ounces. See also p. 38.

RELAPSING FEVER,

known also as recurrent typhus or famine fever, was long confounded with typhus, as epidemics of relapsing fever have usually coexisted with epidemics of typhus. Accurate historical records clearly show how careful observers saw its non-identity with ordinary typhus as far back as 1817, and how this opinion was confirmed by the remarkable epidemic of 1842-43, which was chiefly confined to Scotland. These opinions gained greater strength when it reappeared in 1846, and lingered with varying intensity in different parts of the United Kingdom until 1853, when it entirely disappeared from this country for fourteen years. In 1868 it was again observed in London, and also attacked other large towns. Since 1871 no cases of relapsing fever seem to have been noted. The observations made as to the nature of this fever clearly prove that it is highly contagious; that it is associated with filth, overcrowding, and destitution—notably the latter; that it is allied to times of scarcity, and thus has its home chiefly in the dwellings of the very poor. It is associated with a *spirillum*, which is supposed to enter the system either directly or through the taking of fluids or solids. The spirillum was first noticed by Obermeyer in the blood of a patient suffering from relapsing fever. It has since been seen by many observers, but most authorities are agreed that it is to be found only during the paroxysms of the disease, and that as the temperature falls the micro-organisms disappear. When a specimen of blood containing them is placed under the microscope they appear as long and very delicate unsegmented threads twisted into spirals. Their average length is about six or seven times the diameter of a red blood corpuscle. They have a brisk vibratile movement in the direction of their long axis, and are extremely sensitive to reagents of all kinds, even the addition of distilled water causing them to disappear. The period of incubation of this fever is from five to seven days. It is most common in early childhood, and from the twentieth to the thirtieth year. Between thirty and fifty it is rare; and after fifty it is scarcely ever seen.

Symptoms.—Unlike the other fevers mentioned, it has no forewarners. The disease sets in suddenly with headache and intense fever, which at once prostrate the patient, and it is accompanied with thirst, loss of appetite, pain in limbs, and burning heat of skin. The temperature for the first two days is usually 102° F. morning, and 104° F. evening, and then it mounts to 105° F. and 107° F. The pulse is weak and quick, and the skin moist. The tongue is thickly coated, not parched and black, as in typhus. The bowels are constipated.

On the second day the liver and spleen, especially the latter, notably enlarge—not merely from day to day, but from morning to evening. There is little delirium. The high fever, the rapid loss of strength, the splenic enlargement, indicate a fever likely soon to be fatal; when, as suddenly as it came, on the fifth, sixth, or more usually on the seventh day, there is a crisis, with profuse sweating, rapid fall of temperature, and complete improvement of all the symptoms, with entire decrease of the splenic enlargement. The only thing left is great languor, which sometimes may approach syncope.

This interval of freedom lasts usually a week, when a relapse occurs, generally at night, with all the symptoms which characterised the previous attack. This attack is, however, shorter, lasting only three or five days. It suddenly ceases, leaving the patient weak and anæmic, and entailing a lingering recovery of from four or five to six weeks. As many as four or five relapses have been known.

Prognosis and Complications.—In only two or three per cent of the cases is the fever fatal. Death may occur from the intensity of the fever, or from complications, as pneumonia or abscess of the spleen.

Post-Mortem Appearances.—If death occur from the disease, the spleen may be found greatly enlarged, the capsule tense, the parenchyma soft and pulpy, with wedge-shaped infarctions due to emboli. The liver and kidneys are also congested. Nothing of special note is observed in the other organs.

Treatment.—Rest in bed, cleanliness, milk, strong soup, and wine are necessary. Cold lotions or ice may be applied to the head, to relieve headache; and water charged with carbonic acid given to allay thirst. For splenic pain apply cold applications or continuous poultices.

Ten drops of dilute phosphoric acid should be given in sweetened water every two hours; if symptoms of collapse, ammonii carbonas and alcohol; if delirium, syrup of chloral, 30 minims every hour, until two or three drachms have been taken, unless sleep has been previously produced.

During convalescence, good nourishing diet, with wine, and the preparations of quinine and iron, are essential.

[Table

TABULAR STATEMENT OF CHIEF POINTS IN FEVERS

		Incubation.	Eruption appears on	Eruption fades on
Typhus	usually	1 to 14 days	5th day of fever on back and sides	14th day of fever.
Typhoid	,,	14 to 21 days	7th or 8th day of fever, or even later, on abdomen, in successive crops	the last crop on the 21st to 30th day of fever.
Scarlet Fever	,,	2 to 6 days	2nd day of fever on trunk	5th day of fever.
Small-Pox	,,	12 to 14 days	3rd day of fever on face and forehead	scabs form on 9th or 10th day of fever, and fall off about the 14th.
Measles	,,	10 to 14 days	4th day of fever on forehead	7th day of fever.
German Measles (Rötheln)	,,	7 to 14 days	1st to 4th day of fever on face	4th to 6th day of fever or sooner.
Chicken-Pox	,,	10 to 14 days	1st day of fever on shoulders, in successive crops	on 4th day of fever the vesicles form scabs.

SMALL-POX

The first authentic narrative of small-pox as a distinct disease is given by an Arabian physician, Rhazes, in the year 900, and it was recognised in after-years as the most dreadful scourge of the human race, as the hereditary curse of mankind, as an inheritance which neither time nor medicine could dissipate. To rob it of some of its terrors, to modify its most alarming features, Lady Mary Wortley Montagu, in 1718, introduced the practice of inoculation. The essential character of this proceeding was the insertion of small-pox matter into a healthy person, and it was found that small-pox so imparted gave rise to a milder form of the disease, and less chance of succumbing to the virulence of the poison than when caught in the ordinary way. The benefits conferred by its adoption were great to the inoculated ; but small-pox perpetuates small-pox, and in proportion as inoculation was actively undertaken, centres of contagion were multiplied, and almost every home was converted into a hospital. Inoculation did not diminish, nay it actually increased, the mortality from small-pox.

The vitality of the disease was thus not conquered when Edward Jenner, on 14th May 1796, announced the birthday of vaccination. On that day matter was taken from the hand of Sarah Nelmes, who had been infected by her master's cows, and it was inserted into the arm of James Phipps. Satisfactory vaccine vesicles appeared. Subsequent experimenting by small-pox inoculation on the same boy yielded a negative result, and Jenner believed that vaccination, actively and efficiently performed, would in the course of time obliterate small-pox, and cause it only to be remembered like extinct epidemics of the Middle Ages. This estimate —naturally a sanguine one of Jenner's—has not been confirmed, for small-pox still exists, it may be owing to gross carelessness or wilful neglect, or inefficient performance of vaccination ; and when it occurs on an unvaccinated person, it has lost none of those features which rendered it so repulsive and fatal in bygone times. It is still the loathsome malady dreaded by all who have seen it, and even avoided by those who know it only by repute. Occurring, however, on a person who has been previously vaccinated, it is a mild non-fatal disease, and loses also its hideous characteristics. Briefly stated, it may be said then to present an eruption limited to a few scattered uncoalescing pustules, which reach their acme on the fourth day, and then heal and die away. There is no delirium and no pitting in the vast majority of cases, and the mortality is only 1 per cent. Except in the premonitory fever, which is of the same intensity in both, the two diseases are essentially distinct.

After these remarks, it may now be observed that in small-pox a specific poison is taken into the system, and after twelve days' incubation fever is ushered in with shivering, weariness, pyrexia up to 103° F., headache and PAIN IN THE SMALL OF THE BACK, AND VERY FREQUENTLY VOMITING. These two latter symptoms are very characteristic of small-pox, and may guide in distinguishing it, before the eruption appears, from the two other fevers mentioned. Sometimes very acute delirium may appear in the first twenty-four hours, not remaining over three days. In children convulsions are substituted for the delirium. Lachrymation and salivation are often early symptoms. There may be initial measly or scarlatinal rashes. A papular eruption, hard, round, isolated, appears on the third day on the forehead, neck, mouth, hands, then on the trunk, and lastly on the lower extremities. If the papules remain separate and distinct, we have what is termed Simple Small-pox, or Variola Discreta. If they are numerous, they coalesce, and we have Confluent Small-pox, or Variola Confluens.

In *Variola Discreta* we observe on the third day of the eruption a vesicle forming on the papule, and around this an inflamed area. Two days after this the transparent lymph, which the vesicle at first contains, is changed into pus. After this the top becomes gradually depressed until it divides the pustule into two. This condition is termed *umbilication*, and is very characteristic of the small-pox eruption. A peculiar greasy odour, difficult to describe, but never forgotten if once detected, is now apparent in the room.

About the ninth or tenth day the pustule breaks and a scab forms. These scabs fall off about the fourteenth day of the fever, and a red stain is left on the skin, which gradually disappears. Should, however, the true skin be attacked, a permanent mark remains, and the patient becomes pock-marked.

In *Variola Confluens* the simple state of matters we have described is generally altered for the worse. The headache, the pain in the back, and the vomiting are more severe, and a more copious eruption appears. Developing as the simple type did, the vesicles become so continuous as to render it sometimes impossible to put a pin's head between them. This is specially observed in the face, which becomes so swollen as to render the features unrecognisable. Large black scabs form, and the characteristic odour is sickening in the extreme. The mucous membranes of the mouth, larynx, and trachea are implicated. The voice is husky, throat sore, and swallowing is difficult. Cough and dyspnœa are also distressing, and there is delirium.

There is thus a very marked distinction between the general appearance and symptoms of the simple and the confluent type of small-pox, and there is also a great difference in what is termed "The Secondary Fever." This term is somewhat puzzling, and hence it is necessary to explain that the high fever which precedes the small-pox eruption in either form abates when the eruption appears. This is designated "The Primary Fever." It is to be noted that in Epidemic Small-pox patients may catch the infection, and die during the Primary Fever stage, and before the development of the vesicular eruption. It would appear that the intensity of the poison thus early destroys life, but yet during life small-pox may be apprehended if, with great prostration and high fever, there is an intense bright brick-red stippling of the skin, most abundant on the lower part of the abdomen, and on the thighs, accompanied often with scattered "flea-bite" petechiæ, with conjunctival ecchymoses, with "black-eye" ecchymosis, livid markings of the face, and with hæmorrhage from mucous surfaces. The stippling becomes more diffused, deepens in hue to violet, and if the patient lives long enough, becomes the seat of a vesicular eruption. This form of small-pox is termed Hæmorrhagic, Black, or Malignant, and is not infrequently mistaken for purpura, and its non-detection and the failure to separate the patient from the rest of the household may lead to serious consequences. It is said that the "stippling" described is very striking and characteristic.

Fever again appears as the pustules mature on the seventh day of the eruption, or ninth of the fever, and then it is termed "The Secondary Fever," which is of a typhoid or inflammatory type. As might be expected from the description of the two forms of small-pox given, it is slight in the first variety (Variola Simplex), while it is violent in the second (Variola Confluens), and very often proves immediately fatal. It may be accompanied by boils, erysipelas, ulceration of the cornea or of the membrana tympani, or multiple abscesses.

Prognosis.—In persons who have been previously vaccinated efficiently, or in whom the attack is non-confluent, the disease is rarely fatal. In those who have not been vaccinated the mortality is one in three. Further, if the papules be filled with blood (hæmorrhagic form of eruption) or serum, not umbilicated, and if extending, the prognosis is extremely unfavourable. Lastly, the "corymbose" form of eruption (where it groups itself into patches) is of very bad omen.

Treatment.—There is no contagion so sure as small-pox, none which acts at a greater distance, and hence prophylactic measures are of paramount importance. The sick person should be isolated, and those in attendance, before seeing other people, should wash thoroughly and change their clothes. If the disease has entered a household of the poor, removal to a special hospital is essential. Every one likely to be exposed to the contagion should be re-vaccinated, and patients who have recovered should be kept in the strictest quarantine until all crusts have fallen off. Clothes worn or bedding used should be destroyed, and the apartment thoroughly fumigated before again being occupied. Neither vaccination nor medicine is of any avail when small-pox has appeared. The disease must run its course, and all that can be done is to enable it to do so under the most favourable circumstances. The patient should be kept in a cool, well-ventilated room. The diet ought to be light, and saline draughts or lemon-juice may be administered to diminish the thirst and regulate the bowels.

In the secondary fever, if it be severe, quinine (F. 75) and stimulants should be given, with good broth or strong beef-tea. If there is great restlessness, opium or bromide of potassium and chloral (F. 69) are useful. If the sores are sloughy, and the system is greatly depressed, wine or brandy must be administered to sustain the strength through the attack. If the mouth and pharynx are much involved, a weak solution of iron may be employed as a gargle, and mucilaginous drinks, to which some chlorate of potassium may be added.

Locally no escharotic treatment seems of any avail. The pustules should be smeared with cold cream, or carron oil, or carbolic acid lotion (F. 56*a*, 57), or with oxide of zinc and hydrocyanic acid, to relieve the itching (F. 61). Iced compresses, moreover, applied wherever the eruption is abundant, are said to diminish the pain and swelling better than anything else.

When the pustules have burst, some dry powder of starch or oxide of zinc should be applied.

All scratching should be prevented, and to effect this the hands of young patients should be tied.

Warm, slightly alkaline baths may be given during the stage of decrustation every day, and the body afterwards anointed with oil or any kind of fat.

VACCINIA OR COW-POX

The remarkable discovery of Jenner towards the end of the last century marks an era in medicine. All experience testifies that, while vaccination does not infallibly prevent small-pox, it yet so far modifies the disease as to rob it of its disgusting phenomena and sequelæ, and to render it a comparatively trifling malady. It is unnecessary to detail the process of vaccination further than to state that after the simple operation has been performed a little redness and elevation can be detected on the SECOND day. A vesicle with depressed centre and raised edges is seen on the fifth, and reaches its acme on the EIGHTH day. It is now observed to be composed of a number of cells containing clear lymph and situated on a hard base. On the NINTH or TENTH day these burst, and a scab is formed, which finally falls off on the TWENTY-FIRST day, leaving a well-marked permanent cicatrix.

A little constitutional disturbance attends the process.

VARICELLA OR CHICKEN-POX

is a trifling affection, attacking infants or young children, attended with only slight fever, if with any. The eruption consists at first of pimples, which on the second day are converted into unilocular vesicles. These burst on the fourth day, and rapidly dry up. The rash first appears on the SHOULDERS or TRUNK; subsequently it may attack the scalp, but it rarely involves the face. The vesicles come out in successive crops. Chicken-pox has been occasionally mistaken for a mild case of small-pox, and mistakes in diagnosis are apt to occur when there is a small-pox epidemic.

It is therefore to be carefully remembered that the points which should guide us in distinguishing the two are the MILDNESS OF THE PREMONITORY SYMPTOMS; THE FIRST APPEARANCE OF THE ERUPTION ON THE TRUNK INSTEAD OF THE FOREHEAD; THE PAPULES RAPIDLY BECOMING VESICULAR; THE ABSENCE OF HARDNESS ROUND THE VESICLES; AND THE SHORTER COURSE OF THE DISEASE. It seems to have an incubation of fourteen days, and is undoubtedly contagious.

SCARLET FEVER

is eminently contagious. It is usually a disease of childhood, occurring once in a lifetime, and derives its name from the character of the eruption, which is red, minutely punctated, appearing on the second day of the fever or earlier, and lasting three days. The onset is abrupt, and may be attended by vomiting. It commences on the NECK and upper part of the trunk, and thence proceeds to the face, lower part of trunk, and extremities. In addition to the fever and the eruption, the disease evidences itself on the tonsils and mucous membrane of the mouth and pharynx. The infective microorganism of scarlet fever has not yet been cultivated or isolated; it is probably, however, most abundant in the epidermal scales and dust, which are shed from the surface of the body during and after the course of the disease.

It varies in severity, and hence has been divided into

Scarlatina Simplex,
,, Anginosa,
,, Maligna.

In *Scarlatina Simplex* the fever runs a simple and natural course, the eruption appearing after the usual incubatory stage, disappearing on pressure, fading on the fifth day, and terminating generally with desquamation of the cuticle on the face and trunk. This desquamation takes the form of scurf on the body, while on the hands and feet large patches of skin may come away at once. The process of desquamation may continue for days or weeks, accompanied by itching. The tongue in scarlet fever is very characteristic. At first it may be covered with a white fur; as this clears away it becomes red, the lengthened filiform papillæ project, and the organ presents a STRAWBERRY appearance. The tonsils and mucous membrane of the mouth are congested, but in a mild degree.

In *Scarlatina Anginosa* the fever is of a much more violent character, being often attended with delirium, great restlessness, and prostration. The temperature, as in Scarlatina Simplex, rises rapidly, but maintains a higher level—indeed often becoming hyperpyretic. Cases of 108° to 109° F. have been recorded. The eruption may be delayed to the third or fourth day, is of a more livid colour, and it may be even patchy and evanescent. The throat symptoms are more severe, the tonsils being greatly swollen, and ulcers frequently forming on them. The neck is stiff, the submaxillary glands enlarged, and deglutition is difficult. Even after the eruption has disappeared, the throat symptoms do not abate in severity, as in the simple form.

Scarlatina Maligna is attended with marked cerebral disturbance, passing into coma, and with great vital prostration. There is severe vomiting and retching. Tenacious phlegm hangs about the mouth and throat, the teeth are covered with sordes, the tonsil ulceration may become gangrenous, and the breath is very offensive. The rash is irregular in its appearance and its continuance, and is of a livid colour. This variety, as its name implies, is usually fatal. The vital powers succumb to the strength of the poison on the fourth or fifth day, or even sooner. Hope may, however, be entertained if the seventh or eighth day is passed.

The dangers arising from scarlet fever, considered as a whole, do not terminate with the subsidence of the fever. Troublesome and even fatal sequelæ may result. The cervical glands may remain permanently enlarged—abscesses may form—ophthalmia result—or a muco-purulent discharge obstruct the nares, or the throat affection may spread from the pharynx up the Eustachian tube, causing disease of the ear and deafness. In a certain proportion of cases Rheumatism occurs, usually from the fifth to the seventh day, and is sometimes complicated by heart disease. One of the most common and not the least dangerous sequela, however, is the affection of the kidneys, resulting in anasarca and albuminous urine. It is to be carefully observed that this result is common even in those cases where the primary fever was of a mild form. The patient has probably suffered little or no disturbance from the fever, and is perhaps exposed to cold or draughts during the stage of desquamation. The excretory powers of the skin are impeded, and increased work is thrown on the kidneys, bringing on acute desquamative nephritis (acute Bright's disease). This may be ushered in with shivering, fever, and pains in the back, or it may come on insidiously. The face becomes puffy, and this is followed by general swelling, with scanty, high-coloured, and albuminous urine. Under the microscope the urine presents blood corpuscles, coagulated fibrin, and epithelial casts.

Anatomical Changes.—There are no distinctive post-mortem appearances in scarlet fever. The ordinary anatomical changes may be summed up in a single sentence—Superficial œdema of the skin, with inflammation of the fauces, and congestion and catarrh of the tubules of the kidneys.

Prognosis.—The throat is the source of greatest danger. "Whenever," says Sir Thomas Watson, "I see the glands much enlarged at the angle of the jaw, and beneath the jaw, in a child suffering from scarlet fever, I augur ill of the disease." If, in addition, the urine is very scanty and albuminous, the danger is increased by a tendency to uræmia. When these symptoms are absent the prognosis is more favourable. In the majority of cases the dropsy disappears, though a serious permanent injury to the kidney may be the result.

Treatment.—This disease is highly infectious, and when detected prophylactic measures should at once be begun. The room of the patient should be isolated, and a sheet dipped in carbolic acid (1 in 100) should be fastened outside the door, with the view of cutting the room off completely from the rest of the house. If this isolation cannot be effected, the patient should be sent to a special hospital without delay.

In any form of this fever the patient's body should be freely anointed with a weak carbolic oil (1 in 50), and when desquamation sets in the body should be washed night and morning with soap and warm water. In the intervals the body should be smeared with carbolic oil (1 in 25), or with an oil of carbolic acid 1, oil of Eucalyptus 1, and olive oil 8. Patients recovering from scarlet fever should not be allowed to mix with the healthy until desquamation is complete. As a rule, six weeks is the minimum period at which they should be permitted to go out.

In *Scarlatina Simplex* the treatment consists in securing a free action of the bowels, in giving a febrifuge mixture (F. 11*c*) and milk diet, and in insisting upon rest in bed. In this, as in the more severe forms, the throat should be carefully attended to and swabbed out with a mild antiseptic, or a gargle, as chlorine water, may be used.

In *Scarlatina Anginosa* the same line of treatment should be adopted at first, but other measures are subsequently necessary to control the fever and to relieve the affection of the throat. The use of wet-sheet packing or cold baths is now generally avoided. But in hyperpyretic conditions, tepid sponging or the local application of cold to the head and neck often lowers the temperature, while it does not depress the patient. Thus an ice-bag may be applied to the shaven scalp, and at the same time a broad strip of lint soaked in iced water should be wrapped round the neck and throat, and frequently renewed. Sucking fragments of ice affords great relief and has also a cooling effect. Phenacetin may also be given in small doses, as $\frac{1}{4}$ to 1 grain, every hour or two, for children between two and ten years of age. In the case of an adult, when there is much pain and swelling in the neck and about the angles of the jaws, the application of five or six leeches is attended with marked benefit. In the case of a child, hot poultices or hot fomentations should be applied instead of leeches. The secretion which covers the swollen tonsils should be removed by pledgets of moist lint, and the throat should afterwards be sprayed with a weak carbolic solution (F. 49*a*). Older children may use this solution as a gargle, diluted with half as much water. A mixture of potass. chlor., tinct. ferri perchlor., and glycerin (F. 91*b*) is very useful. When there is considerable prostration, ammonii carbonas, 1 to 2 grains in milk, should be given to a child four years old every two or three hours, also beef-tea and wine.

In *Scarlatina Maligna*, while attention must be carefully paid to the condition of the tonsils as previously indicated, yet the main object of treatment is to support the patient by stimulants (dietetic and medicinal). Three or four ounces of port wine may be given to a child, and double and treble that quantity to an adult, in the twelve hours. At the same time 5 to 20 minims each of spiritus ætheris and spiritus ammoniæ aromaticus in sweetened water may be given every hour. Cold applications cannot be recommended, but some state that, when prostration from the first is extreme, a hot mustard bath of a few minutes' duration is attended with benefit. Money recommends a trial of teaspoonful doses of yeast, and Henoch advocates the hypodermic injection of camphor, dissolved in rectified spirit (1 in 5).

During convalescence all exposure to cold or draught should be guarded against, for a chill may cause acute nephritis. The urine should be daily tested, and the temperature taken morning and evening. In some cases the renal complication is marked by no acute, local, or general symptoms, the first sign being anasarca. In the majority of cases an increase of temperature and local pain mark its onset. Treatment now should be prompt and decided. Leeches should be applied to the lumbar region, or this part should be cupped and the further abstraction of blood be aided by linseed meal poultices. An active hydragogue cathartic, as pulv. jalapæ co., should be prescribed, and after it has acted, tincture of aconite in $\frac{1}{2}$ or 1 m. dose should be given in water every ten minutes for two hours, and after the expiry of that time hourly for twenty-four hours. By adopting this treatment I have seen the inflammation cut short. Convalescence from kidney complications is assisted by the administration of iron, in the form of the citrate of iron and quinine, or in the form of the liquor of the acetate of iron, which in such circumstances seems preferable to the tincture of the perchloride of iron. (See also p. 371.)

MEASLES

was long confounded with scarlet fever, and it is only since the beginning of the last century that it has been recognised as a specific and independent disease.

Measles is contagious, but the cause of the contagion is unknown. Susceptibility to the contagion diminishes with years, and SECOND ATTACKS ARE RARE. The incubatory stage of measles, judging from the epidemic in the Fiji Islands, and other isolated instances, lasts from ten to fourteen days.

Symptoms.—Measles may be considered a catarrhal fever, with a characteristic eruption added to it, the eruption appearing first on the face and forehead, and afterwards on the trunk and extremities. The symptoms of catarrh—running at the eyes and nose, cough and sneezing, with great oppression and foul tongue—precede the eruption. The temperature rising rapidly usually shows a distinct remission, even to normal, on the second day. After three or four days, an eruption of small circular dots, at first isolated, appears on the forehead, spreading to the trunks, limbs, and feet. These do not remain distinct, but coalesce, until patches of a reddish colour and of irregular shapes cover the parts affected, accompanied by flushing of the face. Thirty-six hours from the commencement of the eruption the temperature is highest, usually about 104° F., or over it. The eruption lasts THREE days, and fades in the order of its appearance, clearing off the face first; it leaves reddish-brown stains, which may persist for one or two weeks, and a slight branny desquamation, especially from the skin of the face. With the disappearance of the rash, the temperature rapidly falls to the normal, and the other symptoms gradually subside. The above constitutes what may be considered the normal type and course of measles. Yet it should be remembered that there are many departures from this type. Thus we have the essentially mild and the severe.

Of the first variety there seem to be two forms—measles without catarrh, and measles without eruption.

The former attacks chiefly young persons, gives rise to little sickness, yet effectually destroys the after-susceptibility to the disease.

The latter variety is seen during an epidemic of measles, and we are justified in assuming a person to have it, if the catarrhal symptoms are as severe as if the patient had a measly rash, and if the person becomes non-susceptible to the disease.

The essentially severe form of measles, popularly termed "black measles," is generally associated with the hæmorrhagic diathesis. Before or after the eruption of measles, hæmorrhage occurs in various regions: in the skin, causing petechiæ or ecchymoses; in mucous membranes, causing violent bleedings from the nose, or in organs and cavities.

The general symptoms are those of a typhoid character; sordes on the teeth, small pulse, debility and diarrhœa.

Complications. — Catarrhal pneumonia, bronchitis, and laryngitis—an extension of the catarrh down the respiratory tract—are chiefly to be dreaded in measles. They appear after the eruptive stages, and intensify the fever and increase the danger. Of fatal augury are livid lips, cold extremities, and a rapid feeble pulse. Cerebral complications, peculiar forms of ophthalmia, otorrhœa, dropsy, and albuminuria, are not unknown.

Prognosis.—As a general rule it may be stated that measles is essentially dangerous to very young children, and that the danger decreases rapidly with years, except in old age, when it may be fatal. Unusual sparseness or *purpuric* form of the eruption, or the hæmorrhagic diathesis, are bad omens. If the chest is only slightly affected, or not at all, we may predict a favourable result. The great danger is not in the disease, but in what it leaves behind it, such as lobular condensation or collapse of the lung, or a tendency to emphysema in after-life.

Treatment. — As the greatest danger in measles is an extension of the catarrh to the lungs, all exposure to cold must be avoided. The room should be darkened, and the patient kept in bed. Milk diet, attention to the bowels, and a slight diaphoretic mixture are all that are required in ordinary cases (F. 34). In sudden recession of the rash, with onset of delirium, the patient should be placed in a mustard bath, and kept in it for a few minutes till the skin becomes reddened. Cough and hoarseness are relieved by painting the fauces with glycerin of borax, and by the application of cold compresses to the chest. If the coryza be severe, insert into the nostrils a little cocaine and menthol ointment (F. 63*a*). If diarrhœa be excessive, bismuth (F. 20), or oxide of zinc in a little glycerin and water, should be given after each motion; if the temperature be high, phenacetin in the doses recommended under scarlet fever should be given (p. 61), and if measles be complicated with broncho-pneumonia, linseed-meal poultices should be applied to the chest, and an expectorant mixture prescribed of ipecacuanha and citrate of ammonium (F. 34).

In ordinary cases stimulants are not required, but in weakly children, or in a severe type of the disease with a dry tongue and rapid feeble pulse, or in complications of bronchitis or pneumonia, they are indispensable; a teaspoonful of mist. vini gallici is readily taken, and may be given to a child twelve months old every two hours.

RUBEOLA, RÖTHELN, RUBELLA

Synonym, German Measles

The term "rubeola" was brought into use by German physicians about the middle of the last century to designate a disease which it was considered could belong to no one of the acute contagious or non-contagious eruptions, though closely resembling measles and scarlet fever.

Opinions with regard to it have greatly varied, but latterly it has been shown that it is an independent disease by distinct epidemics of it, and by the fact that while it ensures against a second attack of itself, it affords no protection from measles or scarlet fever.

Recognising it, therefore, as a contagious and essentially epidemic, and thus also specific, disease, it may also be noted that it is especially a disease of childhood, attacking indiscriminately boys and girls, and older and younger children, down to sucklings. A second attack is rare—as rare as that of measles. Its contagion is not quite so great as that of measles.

Symptoms—Course.—The invasion is fairly sudden. There may be no initial symptoms. In other cases there is complaint of headache and aching limbs. The throat is reddened and slightly sore. The superficial cervical glands are swollen and palpable. The eyes may be reddened and suffused, but there is little coryza. In a day or so the eruption appears, usually on the face first, in the form of small raised, bright red spots, which coalesce somewhat and gradually spread over the whole body. The temperature may now reach 102. The rash remains out for a day or two, and gradually fades with only the slightest desquamation, and without discoloration of the skin.

Prognosis.—Its almost feverless course makes the prognosis most favourable, but the disease may be complicated with bronchitis, and may have a fatal termination.

Treatment.—The treatment of rubeola is restricted to a suitable regimen ; protection against exposure, keeping the patient in bed if there be fever, and attending to probable catarrh of the air-passages and the pharynx.

Other complications, if any, should be treated according to their nature.

MUMPS, CYNANCHE PAROTIDEA,

is an acute contagious affection of the parotid and other salivary glands, the parotid especially being much swollen and painful to the touch. It is attended with some fever, and difficulty of opening the mouth and swallowing. The contagion of mumps in some cases seems to be very prolonged. One case lately came under my observation, where seven weeks elapsed before the disease occurred in a second member of the family. The disease extends over a period of four or five days and terminates in recovery, its declension being occasionally marked by swelling of the testicles or mammæ.

Treatment.—During the fever the child should be put to bed, and warm fomentations or bran poultices applied to the swollen glands. If the pains be more than ordinarily severe, equal parts of glycerin and extract of belladonna may be smeared over the affected parts. Hyd. c. cretâ $\frac{1}{3}$ grain should be given three or four times daily.

HOOPING-COUGH

is an infectious disease, which usually occurs in childhood, and is preceded by a catarrh, without fever, of three to fourteen days' duration. Succeeding this there is a peculiar characteristic paroxysmal cough, which is heard in no other affection. The child has usually some premonitions of an attack, and runs to its mother or nurse for protection, or it may cling to a chair or table for support. Then commences a distressing series of expiratory efforts, with no noticeable inspiratory movements between them. The face of the child becomes black, and suffocation seems imminent, when there occurs a long-drawn inspiration attended with a crowing or hooping sound. This paroxysm may at a short interval be succeeded by others of varying intensity, and the conclusion of the attack or attacks is by expectoration of thick mucus from the lungs or by actual vomiting. The sound heard is doubtless due to the air entering the contracted, or even partially closed, rima glottidis. When expansion of the glottis has been completed and the air is permitted to enter freely, the attack for the time is over.

The paroxysms occurring in the twenty-four hours vary as regards intensity. As a rule they are worse at night. During the early stages of the disease the mucus expectorated is thick and glairy, but afterwards, when the paroxysms are not so severe, it becomes thinner, more abundant, and more easily brought up.

Only catarrhal sounds, or perhaps no abnormal breathing, are detected by a stethoscopic examination. The expiratory paroxysm may reveal wheezing, but during the long-drawn inspiration no sound can be heard over the lungs. This may be partly explained by the slowness with which the air enters by the contracted glottis, and partly, as Laennec says, by "the spasmodic contraction of the muscular or contractile fibres of the bronchi not allowing the air to enter."

Sequelæ.—Hooping-cough may lead to pulmonary emphysema, and in some cases to extravasation of air into the interlobular and subpleural tissue.

Etiology.—The peculiar spasmodic cough in this disease has given rise to many theories, which attempt to explain its nature. Some deem it a neurosis; some consider it a catarrh of the respiratory mucous membrane; some maintain that it is due to swollen tracheal or bronchial glands pressing on the vagus. These theories do not throw conclusive light on the origin of hooping-cough, which seems to be clearly of an infective character and markedly contagious. The nature of the contagious principle has not yet been definitely established, but Ritter states that the sputum contains lenticular masses, which yield cultivations of a small diplococcus not met with under other conditions. He says the organism is not found in the larynx, but appears to be localised in the lower third of the trachea.

Prognosis.—A paroxysm of hooping-cough is rarely fatal, but as the result of the closure of the glottis, rupture of an intracranial vessel may occur, or disease of the brain or its membranes may be originated, with effusion of serum and a fatal termination. More frequently, however, pulmonary complications, as bronchitis or broncho-pneumonia, occur, which in weakly and delicate children are very dangerous; so much so that one-half or two-thirds of those who are attacked in this way die.

Treatment.—If we assume that hooping-cough is an infectious disease, dependent on the presence of specific organisms, then the antiseptic treatment by inhalations of carbolic acid may do good, if carried out in a thorough and satisfactory manner. To accomplish this the child or children of a household affected should be put in a small room, where there is a fireplace, and where the temperature can be properly regulated. The vapour of carbolic acid, which is developed by dropping the pure acid from time to time on a hot plate, then permeates the room. Direct inhalation of a spray containing pure carbolic acid gr. 4, glycerine 60 ♏, and carbonate of sodium 10 grs., to an ounce of hot water, is still more effective. While using the spray it is necessary to examine the urine frequently, and if any discoloration is detected, the inhalations should be suspended for twenty-four hours. The treatment so adapted cuts short the paroxysms and lessens the severity of the disease, but it does not seem to have any prophylactic influence.

Various methods of treatment in addition have their advocates. Thus Dr. Fuller recommends gradually-increasing doses of belladonna (F. 15*a*); Dr. Gibb nitric acid (F 15); others speak highly of a combination of bromide of potassium and hydrate of chloral; or hydrobromic acid made up with syrup—the dose of which for a child of three years being 8 or 10 minims. Antipyrin in a dose of 1 grain for each year of the child's life, every four, six, or eight hours, is highly recommended. The administration of bromoform, an antiseptic fluid, is said to diminish the frequency of the paroxysms and to shorten the duration of the disease (F. 69*a*).

The use of emetics has found favour which is not undeserved, because it seems to imitate the manner in which nature terminates a paroxysm. At a stated period of the day or night, vomiting should be induced by vinum ipecacuanhæ, or the internal use of apomorphine. Locally, Roche's embrocation has considerable popularity among the poorer classes.

If bronchitis set in, poultices should be applied to the chest, probably after leeching, with the internal administration of antimonial or ipecacuanha wine. If requisite, these may be followed by stimulants.

Head Symptoms.—Squinting, convulsions, or stupor must be met by small and repeated doses of hydrarg. c. cretâ, warm baths, etc.

Dietetics.—The patient should be kept on a regulated diet, with plenty of milk and light puddings, and little meat, while excitement of every kind should be carefully avoided. When the air is cold the patient should not be allowed to go out of doors, but when it is mild and genial a daily mid-day walk is attended with benefit. If the disease linger in its course a change to the seaside, if the time is suitable, does good. In mining districts change of air is sometimes effected by taking the child down a coal-mine.

INFLUENZA—*Synonym*, Epidemic Catarrh

Influenza may be defined as a specific epidemic disease in which there is catarrh of the nose, throat, and air-passages.

The name "influenza" is of Italian origin, and came into use two centuries ago. Its history is supposed to date back into remote antiquity. Whether this be true or not is a question, but undoubtedly during the last four centuries the periods during which influenza has prevailed have been carefully recorded, and Dr. Parkes states that there were eleven epidemics in the sixteenth century, sixteen in the seventeenth, and eighteen in the eighteenth. Between 1800 and 1850 there were no fewer than ten, the last being in 1847-48. It was supposed that the disease had ceased to exist, when in 1889 an epidemic commenced in St. Petersburg and spread nearly all over Europe and to America. The epidemic is not sporadic. It appears to obey no law, but attacks one town and spares another in close proximity, and moves with a celerity by atmospheric influence far outstripping that of any other contagious disease. Pfeiffer in 1892 and other observers since then have described a bacillus which is observed in the bronchial exudate and in the blood of patients suffering from influenza. This bacillus is very slender and short (one to one and a half times as long as it is broad). The bacilli sometimes lie singly, sometimes in pairs or short chains or heaps. The bacillus grows best at body temperature, and it has been cultivated on glycerin-agar through several generations, but it is prone to die off. Animal inoculations have given such diverse and undecided results, that in the present state of our knowledge it must be admitted that we cannot yet definitely regard it as of established importance in the etiology of the disease.

Symptoms and Course.—The onset of the disease in most cases is sudden—so sudden, indeed, that it has been termed *Lightning Catarrh.* Many cases are marked at the onset by a moderate amount of pain in the head, back, and limbs, or by a general soreness over the body as if the patient had been bruised or beaten. In such cases there is always chilliness, followed by a slight rise of temperature and usually accompanied by some sneezing and cough. In a few cases we have intense prostration and cardiac weakness out of proportion to the intensity of the fever.

From a moderate or severe onset there may be certain serious complications of the respiratory system, as very intense bronchitis or broncho-pneumonia. But the most serious complication is pneumonia, the symptoms of which are obscure. There may be little pain or cough, but yet percussion reveals dulness over parts of both lungs. This dulness is not persistent, for though detected at night it may be absent in the morning. There is often an entire absence of rusty sputum, and the attack may end suddenly on the third day. The attack terminates more usually not by a crisis but by a lysis. The chief indications of lung mischief are *dulness* and a high *temperature*, which may rise to 106° F. The less serious complications are *rheumatic pains* and disorders of the *digestive* system. Convalescence from the latter is usually slow. The sequelæ embrace various disturbances of the nervous system, as peripheral neuritis, neurasthenia, incapacity for mental work, and sleeplessness.

During an epidemic of influenza, of whatever type, the death-rate of a town is increased, especially from zymotic diseases. Influenza seems to modify such diseases, and for the worse.

Diagnosis.—The great number of persons attacked, and the severe prostration, distinguish influenza from an ordinary catarrh, with which it is most likely to be confounded.

Treatment.—In every case, moderate or severe, the patient must be confined to bed until the fever has completely disappeared. To fight against an attack, however slight, is foolhardy in the extreme, for serious complications may then arise. The disease is marked by prostration, and from the outset the patient should be well fed and carefully nursed. The best remedy in ordinary cases is quinine, which should be given twice daily in a 2 or 3 grain dose at 12 and 4 o'clock, dissolved in a glass of sherry or a tablespoonful of whisky. Such treatment continued for two or three days is in the majority of cases sufficient, and the patient feels perfectly well. Yet convalescence requires great care, and as a general rule the patient should not leave the house until ten days from the primary seizure.

The treatment in other cases is symptomatic. For the *pains* there are four favourite drugs, salicylate of sodium, antipyrin, antifebrin, and phenacetin. Of these, preference must be given to salicylate of sodium. It is effectual, and full doses of it do not produce the depression which full doses of the others are liable to cause. The *depression* during the acute stage is partly general, partly central, and partly cardiac, and in all cases toxic in origin. Relief follows free action of the bowels, hence give a saline aperient; afterwards strychnine, for by its action upon the cardiac and respiratory centres in the medulla it is the best general stimulant. If there be a tendency to collapse, it should be administered in full doses by the mouth, or in urgent cases injected hypodermically in combination with ether. For *cardiac attacks*, digitalis and strophanthus are inferior to citrate of caffein, which should be administered in 5 grain doses, three or four times daily. Further, associated with strychnine it acts better than when given alone. In urgent cases the sodio salicylate of caffein for subcutaneous injection is a valuable and convenient remedy. It is prepared by dissolving 4 parts of caffein and 3 parts of salicylate of sodium in 6 parts of water.

The most serious complication is *Pneumonia.* Here turpentine stupes should be applied to the chest, and stimulants should be freely given.

The Treatment of the Nervous Sequelæ.—Peripheral neuritis requires rest, and at first hypodermic injections of morphine or anodyne liniments to relieve the pain (F. 57*n*). When the acute pain has been relieved, hot and cold douches over the affected part, followed by judicious massage, are useful. *Neurasthenia* and incapacity for mental work are in some cases benefited by Easton's syrup, which should be given in a 20 m. dose thrice daily after food. In other cases, change of air and surroundings are requisite, with complete freedom from usual work. If circumstances permit, a long sea-voyage is of inestimable value. The *treatment* of sleeplessness is considered at p. 515.

EPIDEMIC MENINGITIS, or CEREBRO-SPINAL FEVER

From time to time in various countries epidemics of a disease with a history of fever, various eruptions, and a number of cerebro-spinal symptoms, as rigidity of the neck or of the whole vertebral column, have been recorded. Hence the disease came to be named epidemic meningitis, or cerebro-spinal fever. While this disease has been known on the continent of Europe and the United States more or less since the beginning of this century, England and Scotland have been comparatively free from it. It has, however, been seen in Ireland in 1846 and 1848, and on both occasions caused many deaths. Cerebro-spinal meningitis may occur by itself or in connection with some other acute infectious disease, such as lobar pneumonia, ulcerative endocarditis, pyæmia, typhoid fever.

Pathology.—In well-marked cases exudations of lymph or purulent deposits are found at the base and the convexity of the brain, and in the depressions and furrows of its surface. The spinal canal presents similar appearances, especially at the lower part and posterior surface. Congestion and œdema are also observed in the lungs, liver, spleen, and kidneys; and degeneration of the fibres of the voluntary muscles, especially of the back. The heart is relaxed, and the pericardium sometimes lined with pus.

Etiology.—The disease is not directly contagious. In most cases investigated the diplococcus intracellularis described by Weichselbaum is found inside the polynuclear leucocytes. In other cases only the streptococcus or the pneumococcus has been found. Males appear to be more often attacked than females—the age being rarely above forty, and rarely under twenty. In some epidemics, children have alone been the victims. It occurs most frequently in the dwellings of the poor, where dirt and damp and bad ventilation prevail. In Ireland in 1846 it affected chiefly the workhouses, and in the United States the negroes.

Symptoms.—The attack is sudden and marked by shivering, pain in the head, vomiting, and rigidity of the muscles of the back of the neck. Extreme hyperæsthesia is a prominent symptom during the illness, the patient shouting out when his skin is touched, even although he may be comatose. The degree of fever is very variable, usually ranging from 100° to 103° F.; occasionally it is normal, and sometimes it rises in the end to 105° or 107°. A peculiar petechial eruption is often present on the neck, breast, or limbs, of a red, purple, or black colour, the spots varying in size from a pin's head to three-quarters of an inch in diameter. The course of the disease is rapid, as some die within a few hours, many within twelve or twenty-four. The first four days are most dangerous; after that time there appears to be a fair prospect of recovery. About half of those attacked die.

Treatment is unsatisfactory. Stimulants are recommended from the outset, with the application of leeches behind the ears to relieve the headache, and ice to the spine and head to mitigate the spasm. Chloral and bromide of potassium, and the hypodermic injection of morphine, have been strongly urged; and its resemblance to malarial fever has suggested the use of quinine.

DIPHTHERIA (Croup, *Cynanche contagiosa*)

Although a disease similar to diphtheria seems to have been well known to the ancient physicians, yet its existence in England under the term "diphtheria" (a skin or membrane) dates back only to 1856, when it spread from France to this country. The first accurate investigations into the nature of diphtheria were made by Bretonneau in 1821. He considered it was a local disease, spreading by contagion through the inoculation of the soft mucous membrane with the diphtheritic exudation. He was subsequently obliged to concede that blood-poisoning was one of its essential characteristics. As its derivation shows, diphtheria is evidenced by the presence of a membranous substance. This substance is the result of inflammation, and is most often seen over the tonsils, uvula, and upper air-passages, but it must be remembered that though most often visible in the parts mentioned, diphtheritic inflammation may occur in the mucous membrane of any part of the body or upon any wounded surface.

Pathology.—Formerly distinctions were drawn between croup and diphtheria, but recent bacteriological investigations have shown that in the overwhelming majority of cases of membranous croup the Klebs-Loeffler bacillus is present. Thus the most cases are simply diphtheritic laryngitis. In some of the non-specific cases the streptococcus has been found. Apart from the bacteriological distinction, there is little difference between the course and prognosis of the two forms of the disease. The non-specific form is, however, very rare. The diphtheritic exudation covers an ulcerated surface, which manifests not only death of the epithelium, but of the underlying mucous membrane as well; while in the croupous form the epithelium is alone involved, and leaves, when the exudation is stripped off, no ulcerated surface beneath it. The exudation is in both cases grayish ashy-white in colour, and its consistence is like that of wetted parchment or damp wash-leather. It is composed of glistening homogeneous fibrin, disposed in the form of a network, of which the meshes vary in form and size, and enclose epithelial cells, blood and pus corpuscles.

Bacteria of various forms are commonly present in the false membrane of diphtheria, and some of the forms may penetrate deeply into the underlying tissue. The *germ*, however, which stands in a causative relationship to diphtheria, and which is frequent in the pseudo-membrane, is the bacillus diphtheriæ of Loeffler. In its typical form it is a moderately stout, round-ended, non-motile bacillus from 2·5 to 3 μ[1] in length and 0·5 to 0·8 μ in thickness. At body temperature it develops rapidly in culture media, as in bouillon and on agar, glycerin-agar, and blood serum. It does not form spores. It is killed in the fluids by an exposure to a temperature of 58° C. But it may remain alive for weeks or even months in fragments of dried membranes.

Symptoms and Course of Croup.—The symptoms at first are those of acute laryngitis. The child is restless and feverish. The throat is sore, and there is hoarse and a harsh cough. In a day or two the symptoms become more severe, and the child may wake up at night with signs of impeded breathing. At first the difficulty is paroxysmal but soon becomes constant. The dyspnœa is both inspiratory and expiratory. The subclavicular and lower intercostal spaces become drawn in during inspiration. There is cyanosis and loss of voice.

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[1] $\mu = 0·001$ mm.

The usual duration of the disease, when severe and unchecked by medical treatment, is about thirty-six or forty hours. If the alarming symptoms are not moderated in twelve hours, it generally proves fatal. If medically treated the symptoms decrease in severity and the child recovers, yet convalescence is tedious, and is frequently attended by expectoration of portions of membrane. In a milder form of the disease, where the difficulty of breathing is not so grave at the commencement, the cough on the second day becomes loose, the fever declines, the skin becomes moist, and the crowing sound of the voice ceases.

Etiology, Symptoms, and Course of Diphtheria.—There seem to be good reasons for believing that diphtheria has appeared in some cases to be due to polluted water, bad drainage, or foul air, and it is certain that it may be transmitted by milk. Recent researches of Klein give circumstantial evidence that cats suffer from a form of diphtheria similar to that which affects human beings, and to the possibility that cats may have been the originators of epidemics of diphtheria among the human inhabitants of the households to which they belong. However originating, the symptoms of diphtheria are diverse. They follow no rule. They may be attended with fever and marked constitutional disturbance, or the fever may be slight or altogether absent. With or without fever we may say that the general features are prostration, restlessness, headache, and nausea, and a sense of stiffness and soreness about the neck and the angles of the jaw. There may be some difficulty in swallowing, and the pain accompanying this varies, being sometimes pricking or severely darting and shooting. When the fauces are examined at an early stage they will be seen to be swollen and violet-red in colour, and the same swelling and redness are observed on the uvula, palate, and posterior wall of the pharynx. On the violet-red surface after a few hours, or at most two days, characteristic evidence of diphtheria is seen in whitish-gray spots, small at first, and distinct.

In favourable cases, and with little constitutional disturbance, recovery takes place in two or three days, and the white spots are no longer seen. But in the majority of cases the disease advances. The spots cease to be distinct, they run into one another and extend in every direction, so that no longer spots but exudations are seen. These exudations may creep backwards and upwards into the posterior nares; or more frequently they pass over the epiglottis into the larynx and trachea. The cervical and submaxillary glands, at first only sore and stiff, become swollen, and the tissues around are also œdematous from the infiltration of inflammatory products. In consequence the "hollow of the neck" disappears and a uniform brawny mass conceals the natural condition of parts. Shortly afterwards the exudations soften and decompose, and are partly shed in patches of membrane. As the result of this the breath becomes fœtid, saliva dribbles from the angle of the mouth, and swallowing becomes very difficult. These serious local symptoms are accompanied by great constitutional depression, the pulse, though quick, becomes daily smaller and weaker, marked blanching is seen on the face, and the muscular strength is visibly diminished. A typhoid state may develop with sordes on the teeth and lips, and with delirium of a low type. Such cases usually end in death through pneumonia or œdema of the lungs, or through suffocation, or by gradual asthenia. Often death takes place suddenly from syncope while the patient is attempting to sit up, and this may occur even when recovery seems to be complete.

It is a noteworthy fact that the urine is found albuminous in 50 per cent of the cases.

The dyspnœa of diphtheria is due to several causes, acting together or in succession—the most important of these being the *mechanical* one, viz. the swollen mucous membrane on the one hand, and the muco-purulent secretion on the other, obstructing the narrowed glottis. To these purely mechanical causes must be added another of subordinate importance, viz. *the paralysis of the laryngeal muscles.*

The only positive proof of diphtheria is the discovery of the Klebs-Loeffler bacillus in the exudation. In doubtful cases a bacteriological examination is essential. Loeffler's blood serum is poured into a test-tube and coagulated by heating. A sterilised cotton swab is then rubbed over the most suspicious patches in the throat. The surface of the serum is inoculated by passing the swab freely over it. The tube is then placed in an incubator at 37° C., and in fourteen to twenty-four hours growths become visible as small hemispherical grayish colonies. Preparations made from them and stained with methylene blue are then examined; if no bacilli are found, a second culture is made from the former culture, and is examined at the end of twenty-four hours. The virulence of the culture may be tested by injecting it into guinea-pigs.

Sequelæ.—In non-fatal cases the specific disease is supposed to terminate on the seventh day, although the convalescence after this is slow and attended with great depression. After the complete healing of the local lesions, in the course of the second or third week of the disease various sequelæ may ensue, viz. paralysis of the soft palate and pharynx, and paralysis of the muscles of the larynx, occasioning in the one case difficult deglutition, in the other impaired voice. Sometimes there are great disturbances of vision and progressive paralysis of the extremities.

The course of the paralysis mentioned is gradual and characteristic, paralysis of the soft palate and pharynx being first noticed. This is followed, either immediately or shortly afterwards, by impaired vision, while paralysis of the upper and lower extremities occurs later. The ordinary termination of diphtheritic paralysis is in cure, and it is also noteworthy that the muscles which were first paralysed are also the first to recover their activity. The process of cure occupies from six or eight weeks to two or three months. A fatal termination has been noted in 8 to 10 per cent of cases of diphtheritic paralysis, but then only through intercurrent diseases, or from food entering the larynx, which is paralysed, and thus causing suffocation, or setting up broncho-pneumonia.

Prognosis.—The average mortality of diphtheria ranges between 30 and 40 per cent. The disease is more fatal in young children than adults, for in adults the grave laryngeal type is not often seen.

Treatment of Croup.—In strong children leeches may be applied to the sternum. Inhalation of steam is recommended. The bed should be covered with a tent. Emetics are useful, and of these the sulphate of copper is to be preferred to zinc, as tending less to weaken the system. 10 to 15 grains of the former should be dissolved in 2 ounces of water, and a large teaspoonful of this given every five minutes until vomiting is produced. Ipecacuanha may also be used—a teaspoonful of the wine being given at frequent intervals until the child vomits (F. 42).

If the vomiting relieves the dyspnœa and expels the false membrane, it has done good and ought to be repeated. If it fails in these objects its repetition is contra-indicated. A solution of nitrate of silver should be applied at intervals of several hours to the entrance into the larynx. The bowels should also be acted on either by an enema or calomel. If, with the addition of a warm bath, hot pack, or hot sponging, these means fail, after a trial of twelve hours, tracheotomy or intubation should at once be resorted to.

Treatment.—In the treatment of diphtheria we have to consider—1st, its local origin in a specific bacillus which develops and affects the system by means of soluble toxins; 2nd, the grave constitutional disturbance thus induced. Treatment therefore must be local and constitutional. We will speak of these separately, but we should never forget that they must proceed *pari passu*, and this conception of the disease and its treatment must not be lost sight of in the remarks which follow.

Local Treatment.—Local treatment aims at destroying the specific germs. These are found in an active growing state in the deeper layers of the exudation. To enable our antiseptic agents to penetrate to the germs, the superficial mucus should be cleared off by dilute lactic acid (1 part in 8 of water) used as a gargle or as a spray in the case of children. The antiseptic lotion is then applied by means of cotton-wool swabs or sponge-sticks. The antiseptics chiefly used are solutions of carbolic acid or perchloride of mercury. Preference should be given to the former, for not only does it anæsthetise, but it soaks more deeply into the parts to which it is applied than the mercury solution. The tonsils and fauces from which mucus has been removed should be swabbed every two hours with a solution of 15 m. of pure carbolic acid, glycerin ℥i., water ℥i. The swabbing is done by small, soft sponges held in a sponge-holder. Three of these are used at each application. Unless disinfected they should not be used a second time.[1] The routine use of diphtheria antitoxin has reduced the mortality of the disease by one-half. The earlier it is employed the better. Thus of 412 children in whom it was used on the first day of illness only 1·2 per cent developed laryngeal complications, as against 16 per cent in cases treated without antitoxin. Its use has not only lowered the number of cases requiring tracheotomy, but has doubled the number of recoveries after operation. The more concentrated the preparation the better is the antitoxin. A full dose of 1500 immunising units should be injected into the scapular region or the subcutaneous tissue of thighs, even before the diagnosis is bacteriologically confirmed. If necessary the dose should be repeated in 10 to 20 hours. Urticarial rashes are frequently noted after the injection.

Nasal diphtheria is generally secondary to the throat affection; sometimes it is primary. In either case irrigation and spraying of the nasal cavities should be diligently enforced. The best solutions, applied with a syringe or a ball spray, are, according to Jacobi, chloride of sodium, saturated boric acid, or one per cent solution of carbolic acid, or one part of perchloride of mercury, thirty-five of chloride of sodium, and one thousand of water. When the larynx becomes involved in the case of a child, its bed should be enclosed in a tent, and the enclosed space saturated with steam from a kettle provided with a long tube. When the signs of obstruction are marked, tracheotomy or intubation should be performed without delay. For further treatment see Therapeutical Index.

Medicinal and Dietetic Treatment.—From the first detection of the affection stimulants should be given freely. *Their use should not be delayed until the heart's beats begin to flag.* Sir William Jenner relates the case of a child of three years of age who had from three to five ounces of brandy given to him with advantage in twenty-four hours. While no general rule can be laid down as to the amount to be ordered, yet it is to be remembered that quantities far larger than those mentioned in Jenner's case may be given to children without producing any toxic effect.

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[1] A more thorough germicide treatment has been successfully carried out at Belvidere, Glasgow. In all cases where the tonsils were enlarged, they were excised even beyond the infected areas, and a solution of equal parts of carbolic acid and glycerin was afterwards applied (*Glasgow Medical Journal*, June 1894).

Liquid food alone can be given, and this should be of the most nutritious kind, *e.g.* soup, preferably turtle soup, pounded meat with light broth, milk and cocoa. As swallowing is always painful, it is better to give a considerable quantity at a time rather than a little at stated intervals. In very young children the giving of food generally involves a struggle with the nurse or mother. Nutrient enemata should then be used.

In this country, medicinal treatment, directed to the general state of the patient, consists in giving tincture of perchloride of iron with glycerin, or with glycerin and potass. chloras (F. 75*a*). In the United States the treatment from the very commencement is usually perchloride of mercury, sodium chloride, and glycerin (F. 3).

During *convalescence*, to avoid the danger of sudden attacks of syncope, the patient must be kept in the recumbent position as much as possible, and not allowed to feed himself. Nourishing food and wine, preferably port wine, must be freely given. In diphtheritic paralysis, if there is much difficulty in swallowing from pharyngeal paresis, it may be advisable to feed the patient with the stomach-tube or by rectal alimentation. Recovery usually occurs spontaneously within three or four months, but this period may be shortened by tonics, *e.g.* iron, quinine, or strychnine, and the continuous current in conjunction with massage.

ERYSIPELAS (’Ερύω, I draw ; πέλας, near)

Erysipelas is an acute inflammation attacking the skin and mucous membranes, and is due to streptococcic infection.

The part affected is reddened, swollen, and painful, and in addition there are constitutional symptoms due to the absorption of the toxins. Fehleisen described as the specific germ the streptococcus erysipelatis, which is very closely related to the pyogenic streptococci. It is stated that erysipelas has been caused by the inoculation of streptococci obtained from ordinary pus. Anatomically the process consists of an intense lymphangitis. The streptococci are found in the lymph spaces, and are most abundant at the spreading edge. In severe cases there may be suppuration and secondary metastatic abscesses in the viscera. In most cases erysipelas spreads from some wound or abrasion of the skin. This breach is patent in erysipelas following on surgical operations, but its existence is not always so evident when it ensues on no surgical procedure. In the great majority of cases of facial erysipelas erosions can be detected in the mucous membrane of the nose, mouth, or eyes, and at one or other of these points the organism enters. In other so-called "idiopathic" instances, where no actual breach of continuity can be seen, "there is a strong presumptive evidence of its occurrence."

Various conditions seem to aid its development and augment its virulence, and these may be considered predisposing causes. Thus defective sanitary arrangements favour its occurrence, and if it assumes, as it sometimes does, an epidemic form, it selects persons living in unhealthy dwellings, and preferably those who are addicted to alcoholic excesses; those who are suffering from dropsy arising from renal, cardiac, or hepatic disease; women in the puerperal state, or all those who are poorly fed or clothed.

These so-called epidemics, experience has shown, are specially frequent when the wind is keen and cold, or when the weather is damp and depressing.

Antiseptic improvements in the treatment of wounds have notably diminished its occurrence in surgical wards, and when it does occur, the prompt removal of a case of erysipelas to an isolated ward has reduced to a minimum the chance of its spreading. It is noted that one attack of erysipelas does not protect a patient from its recurrence, but rather tends the other way. Acute attacks are most common in the period of active life from twenty to forty, and less acute attacks from fifty to old age. It may occur in infants, but after infancy it is rare until adult life. The sexes are affected equally.

Symptoms.—The following description applies especially to erysipelas of the face and head, the form of the disease which the physician has most often to treat. The *incubation* is variable, probably from three to six days. Chilliness, nausea or vomiting, and sudden elevation of the temperature to 102° or 104° F., usher in the attack, and there is also a burning or pricking pain at its local site, which generally is at the nose, less often on the cheek, the ears, or the hairy scalp. The skin becomes tense, swollen, and œdematous. The spreading edge is distinctly raised, and hard processes may be felt running out from it into the healthy skin. Any pronounced fold of the skin may for a time form a boundary line, beyond which the disease does not extend. The naso-labial folds or the border of the hairy scalp may limit it, but these limits may be overstepped, and the whole face and hairy scalp are involved in the inflammatory process. The features of the face then are indistinct, and the countenance is one red, bloated mass. The formation of blebs is common on the eyelids, ears, and forehead. As a rule, if it invades the scalp, the inflammation only stops at the nape of the neck. In a small number of cases it extends to the back, the arms, and even to the feet; and if so the erysipelas is termed "migrans." When the spreading process is about to cease, the redness becomes less intense, appears only on particular spots, and finally stops completely. The fever varies with the severity of the case, ranging from 102° F. to 106° F. It is not always continuous, for there are distinct intermissions and distinct exacerbations. And it may terminate with a crisis, or in erysipelas migrans with a lysis. With the fever there is constitutional disturbance, intense headache, delirium and restlessness; at times there may be distinct stupor. Gastric symptoms are evidenced by a thickly-coated tongue, vomiting, constipation, occasionally diarrhœa.

Duration.—The course of erysipelas varies. A slight case may get well in a few days, but most cases of average severity last a week or more. Erysipelas migrans may continue for weeks. Local complications are rare.

Prognosis.—The prognosis is favourable in a healthy person, but in drunkards it may be complicated with delirium tremens, and the issue may be fatal. Erysipelas migrans may from its continuance exhaust the strength of the patient. Erysipelas may also be complicated with acute bronchitis, pneumonia, or nephritis.

Diagnosis.—Acute facial eczema or erythema, or even urticaria, may be confounded with erysipelas. A cautious diagnosis should therefore be given until the characteristic border and peculiar extension of erysipelas have been observed. Erysipelas may also be mistaken for scarlet fever, measles, or small-pox. The redness of scarlet fever is not, however, localised, and it is accompanied by throat complications. Nasal and catarrhal symptoms are observed with or before the eruption of measles. A small-pox pustule is never solitary, others may be seen in different parts of the body; and there are premonitory symptoms in small-pox, such as vomiting and pain in the back.

Treatment.—In all cases of erysipelas, simple or severe, it is well to act on the bowels, unless diarrhœa exists, by a powder of calomel and jalap (F. 23). When the cathartics have done their duty, then the way is paved for the exhibition of the tincture of the perchloride of iron, in infusion of quassia. Thirty to forty minims of the tincture may be given every three hours until the temperature is lower, when the medicine may be taken in progressively lower doses, until convalescence is certain. Then the administration of iron may be stopped, and preparations of quinine ordered (F. 75). For headache and insomnia a full dose of bromide of potassium is preferable to any preparation of opium, yet when diarrhœa is a prominent symptom opium is more serviceable than any other astringent.

In a very severe case, when the fever is high and delirium and extreme restlessness are prominent symptoms, no remedy is more valuable than a cold bath of 80° F. for fifteen or twenty minutes. The patient bears this well, and if necessary it may be repeated twice or thrice in the day.

Instead of the iron treatment, some trust to quinine in a dose of 6 or 10 grains every six hours, or to antipyrin or antifebrin. These remedies, however, in my opinion, are not so efficacious as iron in tiding the patient over a severe attack.

The *local* measures recommended are numerous, the most popular being a protective covering, as flour, powdered starch, or oxide of zinc, to the affected part; or as more complete protective agents, a mixture of castor oil and collodion, or painting the surface with a solution of nitrate of silver. Antiseptics are now much used. Good results are obtained by smearing the part freely with a mixture of ichthyol and lanoline in equal parts and then protecting it with salicylate cotton and gauze, or by constant painting of the part with a 5 per cent solution of carbolic acid in rectified spirit, or by applying cloths dipped in a 1 per cent solution of the same acid and then covering with oiled silk.

In erysipelas of the leg I have repeatedly observed a good result from the application of solid nitrate of silver after moistening the skin with distilled water. An encircling band was made in such cases above the erysipelatous blush, and this line of demarcation prevented its extension.

Dietetic Treatment.—Solid food cannot be taken; yet, as erysipelas is a disease in which there is great exhaustion, the dietary should be specially attended to. Milk, beef-tea, eggs, should be given at regular and stated intervals; and also alcohol, if typhoid symptoms appear, the amount to be regulated by the state of the pulse and the temperature.

PYÆMIA AND SEPTICÆMIA

It has long been known that a certain number of persons who have received wounds by the hands of the surgeon or by accident may suffer from grave constitutional symptoms and develop lesions. To indicate the nature of these conditions various terms have from time to time been introduced, such as pyæmia, septicæmia, traumatic or inflammatory fever, purulent infections, etc. The unsatisfactory divisions formerly attempted have now been fairly settled, owing to our better knowledge of micro-organisms; and we are able to make a general distinction between two typical phases, Pyæmia and Septicæmia.

In pyæmia we have the introduction into the system, from a focus of suppurative inflammation of the germs or their products, of Staphylococcus pyogenes or Streptococcus pyogenes, or both. Their distribution gives rise to fever, and embolic, inflammatory, or suppurative foci in various parts.

In septicæmia, on the other hand, we have a general febrile infection without the development of suppurative foci, and this infection is due to the absorption of toxic substances, such as toxins, tox-albumins, or other products of bacterial change; —the fundamental difference in the conception of the two conditions being that septicæmia is a general septic intoxication without lesions, which show the distribution of pyogenic germs through the blood or lymph, while in pyæmia such a distribution has occurred and secondary inflammatory foci have been established.

In connection with *acute* pyæmia the abscesses chiefly appear in the pleuræ, the pericardium, and the peritoneum, and if pyæmia depends upon ulceration of the intestine, the secondary abscesses are formed in the liver (Portal pyæmia). Dr. Wilks terms malignant endocarditis *arterial* pyæmia, for here the thrombi and micro-organisms are carried by the blood-stream to distant organs and may produce suppurating infarcts in the brain, kidneys, and spleen.

In *chronic* pyæmia the abscesses appear in the subcutaneous tissue and joints. The *characteristic symptom* of *acute pyæmia* is fever (103° to 104° F.), which is ushered in by a rigor and followed by profuse sweats. The fever is intermittent, and occurs either daily or every other day; during the intervals the pyrexia may be slight. The constitutional disturbance is marked by loss of appetite, nausea, vomiting, rapid loss of flesh, and transient erythema. The spleen is enlarged, and its enlargement is attended with great pain, and if the lungs be involved there are dyspnœa and cough. The skin is at first pale, but after a time it becomes bile-tinted. Usually a typhoid state is developed and the patient dies comatose. In *chronic* cases there is a succession of abscesses for several weeks or months, the fever varies, and the patient may recover, or death may take place from exhaustion. In connection with *septicæmia* we find divisions according to the intensity and cause of the blood-poisoning: (*a*) fermentative fever, which is seen sometimes after an operation, and which does not last long; (*b*) sapræmia, which is a septic intoxication caused by the ptomaines produced in wounds by the putrefactive bacteria; (*c*) progressive septicæmia, which is not the result of ptomaines but the entrance of organisms (pus microbes) into the blood from some local septic focus; these reach the blood either through the blood-vessels or through the lymph channels. It will be noted that this condition is equivalent to one of pyæmia without the formation of metastatic abscesses.

In these latter forms the *symptoms* differ in intensity, presumably in proportion to the amount of poisons absorbed, and consist mainly of fever, with high temperature, quick feeble pulse, prostration, dry tongue, and the usual accompaniments of the typhoid state.

Treatment.—The treatment of pyæmia and septicæmia is largely a surgical problem. The cases seen in medical practice usually have visceral abscesses or ulcerative endocarditis—conditions which are beyond treatment. We have simply to be content with the employment of general measures to sustain the patient's strength, as the liberal administration of nourishment and stimulants.

CHOLERA

Synonyms, Asiatic Cholera, Epidemic Cholera

The authentic history of epidemic cholera dates back only to 1817, when it made its first appearance in India. After a series of destructive epidemics in the East, it reached Europe, and was imported from Hamburg to Sunderland on October 26, 1831, thence spreading to the great centres of population in this country. This epidemic lasted during 1831-32, when there was a lull; the next epidemic being in 1848-49; the third during 1853-54; and the last in England during 1865-66, when it was chiefly confined to London.

Micro-organism.—There can be no doubt of the fact that a definite and morphologically distinct parasite exists in the discharges of cholera patients, and Koch describes the cholera bacillus as a short rod-like form, curved or semicircular, thicker than the bacillus of tubercle. Such bodies often lie together with the concavity of their curves turned in opposite directions, and their extremities in contact, so as to form an S-shaped figure. They produce by division peculiar screw-like spirals, which remind one of the spirillum of relapsing fever, only that they are thicker. These parasites develop in the gastro-intestinal tract, in the fluid and flakes, inside the glands, and may even penetrate between the epithelium and basement membrane of the small lymph and blood vessels and of the subcutaneous connective tissue, and Koch states that by injections of pure cultivations of comma bacilli cholera can be induced in animals.

Animals so treated die in a short time; comma bacilli are found in the intestines in extraordinary numbers after death. If the parasitic origin of cholera is granted, it can be understood how in different degrees of vitality these germs can be carried by the air in viewless numbers, and impregnate the water-supply, or be drawn directly into the mouth; the different degrees of vitality accounting, to some extent, for the choleraic diarrhœa which, as will be seen, always accompanies the true disease. Cholera is only to a slight extent directly contagious. Doctors and nurses attending the sick are rarely attacked. Infection is chiefly spread by the dejecta. Hence those engaged in examining the stools or in washing soiled linen are more apt to be attacked.

Cholera is more common in hot than in cold weather. Although common in childhood and adult life, it is pre-eminently a disease occurring between twenty and thirty. Excesses of every kind, whether of food, wine, or fruit, during the continuance of the epidemic, predispose to it. The average incubatory period is from one to three days, rarely exceeding one week. About one-fifth of those attacked survive.

True Cholera.—*Symptoms:* Diarrhœa of an epidemic character rarely fails to precede the real attack, and may last from a few hours to some days.

The symptoms of cholera vary greatly in intensity, especially in tropical countries. In many cases at the beginning of an epidemic the patient, apparently overwhelmed by the poison, falls down, and dies within one or two hours, without vomiting or diarrhœa. In typical uncomplicated cases, as observed among primitive races, the first symptom is always giddiness or swimming in the head; and in a short time the contents of the stomach are suddenly ejected without much nausea. A peculiar sensation of faintness or sinking is next experienced, and then the bowels are evacuated. In very severe cases the patient becomes pulseless at the wrist within one or two hours, and before the vomiting or diarrhœa has proceeded to any great extent a cold perspiration covers the body, and although the surface has the cold feeling of a dead body, the patient complains of an intense burning heat, and implores to be sponged with cold water. There is persistent vomiting and diarrhœa, with intestinal cramps; the body becomes shrivelled and corpse-like; the bladder is empty, but there are intense and frequent calls to micturate; the voice becomes croaky; the carotids cease to pulsate, and death supervenes, the body having the appearance of being dried up.

In this country the attacks frequently commence during the night, and the symptoms are less intense. The patient awakes chilly and dizzy, a tempestuous diarrhœa rapidly follows. The early stools are observed to be black and pappy; but as the bile pigment quickly disappears, they show the CHARACTERISTIC RICE-WATER APPEARANCE. They are passed involuntarily and painlessly, and in number vary from three to fifteen. After the diarrhœa has lasted one or two hours, vomiting, attended with no pain, sets in, at first of the food which may have been taken, and latterly assuming a colourless whey-like appearance. Intense thirst and suppression of urine are now prominent symptoms. The tongue is, as a rule, white. After a few hours distressing cramps supervene, especially of the calves and feet—rarely of the hands. Sometimes these are entirely absent, and the patient sinks without a struggle. There is also a considerable fall of temperature, commencing in the hands and feet, and most marked on the face, nose, and tongue. Should there be a tendency to recovery, the temperature approaches the normal;

if it does not, the features become more pinched, the extremities more cold, livid, and collapsed, the eyes dry, and the cornea cloudy; the voice assumes a hoarse and raveny character, or it may sink into an inaudible whisper. This peculiar character has led to its being called "vox choleraica." This stage has been termed the algide or cold stage, and either terminates in death or passes into what is called the stage of reaction. The earliest sign of improvement, preceding even the abatement of the diarrhœa and vomiting, is the RETURN of the PULSE at the wrist. Heat follows, the blueness disappears, the temperature becomes normal, and convalescence may be regarded as perfect in from ten to fourteen days. Sometimes the improvement is only transient, being followed by uræmia, or inflammation of the kidneys or intestines. During the attack proper the patient may die in from six to eight hours; even in bad cases the usual time is, however, twenty-four hours.

Morbid Anatomy.—Cadaveric rigidity is marked. The chief changes are in the intestines. At an early stage they are much injected and reddened, and covered with a sticky exudation. Later on the convolutions contain typical rice-water contents. The mucous membrane shows coagulation necrosis and exfoliation. The follicles, especially the solitary, are swollen, and may show hæmorrhage. The brain, heart, lungs, and liver are usually found healthy, while the kidneys are larger than usual, and congested. The epithelium of the convoluted tubes is swollen, loosened, and necrosed. The outline of the cells is lost, and the tubercles become filled with a finely granular mass.

Treatment is of two kinds—prophylactic and therapeutic. During a cholera epidemic all unnecessary meetings, fairs, and pilgrimages should be abandoned. The *materies morbi* being chiefly contained in the dejecta, all excreted matter should be disinfected by chemical agents, or destroyed by fire, and none should be so disposed of as to contaminate food or water. Wells ought to be inspected, defective sanitary arrangements remedied, dirt of every kind cleared away, the sale of unripe fruits and vegetables prevented, soup-kitchens established, and the stamina of the poor built up. The prodromal diarrhœa should, if cholera appears, be checked as early and speedily as possible, according to Lebert, by some preparation of opium, given either by the mouth or the rectum (F. 16, 17, 18). Should these fail, we must now fall back on, or, as some eminent English authorities say, commence with, a teaspoonful of castor oil or rhubarb.[1]

The treatment of cholera, when it has actually begun, is very unsatisfactory; for the disease runs an extremely rapid course, and all medicinal agents are speedily rejected. Astringents are of no avail, and in fact do harm. While no distinct line of treatment applicable to all cases can be laid down, yet the following course of procedure should, if practicable, be adopted. The first two or three hours are those upon which everything may depend. The physician should, if possible, remain beside his patient or patients for an hour or two, having a pocket-case containing morphine, hydrocyanic acid, and carbolic acid of the purest quality, and be ready to administer these as occasion may require. F. 18*a* will be found very useful. Three or four minims of carbolic acid should be added to each dose. The first dose is generally rejected, but a second dose given immediately afterwards is usually retained. If a case is seen early and is amenable to treatment, there can be no doubt of the benefit of carbolic acid. After being given for an hour or two at regular intervals, the vomiting ceases, and fluids are absorbed; the pulse reappears, and there is a reasonable hope of recovery. Ice should be placed on the tongue every few minutes, and carbonic acid water drunk. The hypodermic injection of morphine may be used to allay the pain and cramps, and sinapisms applied over the abdomen, while the legs are rubbed with some stimulating liniment. Should the temperature begin to fall, enveloping the patient in a blanket wrung out of hot water and sprinkled with turpentine, together with the internal administration of the same drug, was, in my experience, successful during the last London epidemic. In rapidly sinking cases brandy or champagne may be given (F. 72), and subcutaneous injections of camphor, 1 grain, in olive oil 20 m. every half-hour.

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[1] In the recent epidemics on the Continent repeated small doses of calomel, $\frac{1}{6}$ to $\frac{1}{8}$ gr., were found valuable, and irrigation of the bowel and rectum with tannic acid (2%) proved useful.

When reaction sets in, a large spoonful of good beef-tea may be taken every three hours, and later on, tea or coffee with milk several times a day. From this we may pass to an increased and more solid diet.

What is termed the saline treatment of cholera consisted in giving in the early stages a seidlitz powder, and after this had acted, plenty of thin beef-tea well seasoned with salt; thirst being relieved by seltzer, soda, or pure water *ad libitum*. By the treatment in this stage a cure was often obtained; if, however, the stage of cramp had been reached, a solution of chloride of sodium ℈i., sodii bicarbonas ʒss., chlorate of potassium gr. vii., was given every half-hour, by the mouth. If there was collapse with an imperceptible pulse, a strong solution of the same salts, dissolved in hot water at a temperature of 105° F., was slowly thrown up the rectum. During the algide stage subcutaneous or intravenous injection of saline solution often causes astonishing, though unfortunately only temporary, rallying.

Anti-Cholera Inoculation.—Haffkine's method has been extensively tried in India. His report of 1899 shows it to be a very valuable prophylactic measure, ensuring a high immunity against attack. It has no curative effect, as the mortality of inoculated and uninoculated persons attacked is the same.

THE PLAGUE

The plague is an eminently infectious disease which is endemic in various parts of the East, as Hong-Kong. It is caused by a small bacillus which is found in the blood, lymphatic glands, spleen, and lung lesions. As a rule the attack is sudden, with rigors, headache, fever, and mental confusion. In one class of cases the glands are chiefly involved. They enlarge and form buboes, which, if the patient survive, suppurate and break down. In another set of cases pneumonia is the chief lesion. In very severe cases there may be cutaneous hæmorrhages and ecchymosis with vomiting of blood, and profound collapse may usher in death without any formation of buboes. Rats and insects are supposed to help in the spreading of the disease.

Haffkine's inoculation method and Yersin's serum have proved directly curative, and of prophylactic value. Failing them, treatment is symptomatic.

MALARIAL FEVER

Malarial Fever.—An infectious disease characterised by (*a*) paroxysms of intermittent fever (ague) of quotidian, tertian, or quartan type; (*b*) a continued fever with marked remissions (remittent fever); (*c*) certain pernicious rapidly fatal forms; (*d*) a chronic cachexia with anæmia and an enlarged spleen.

The characteristic lesions of malarial poisoning are certain changes in the blood, the liver, and the spleen.

In the more intense and acute form of malarial poisoning the blood contains numerous particles of black or brown pigment, which are either free or embedded in cells resembling the white blood cells, and in the endothelium of the blood-vessels. After death this pigment is found in the blood-vessels throughout the body, but is most abundant in the blood-vessels of the liver and spleen. These organs are then enlarged and of a peculiar brown or black colour. In some of the more severe cases there are also extravasations of blood from the mucous membranes, and in their substance; and also general jaundice.

In the milder and more protracted cases of malarial poisoning the composition of the blood is altered, and the patient becomes very anæmic. The spleen may become the seat of chronic interstitial inflammation with pigmentation. The liver may exhibit the changes of interstitial hepatitis.

The Specific Germ.—The bodies which have been invariably found associated with *all forms* of malarial fever belong to the protozoa and to a group of organisms known as the *hæmatozoa* (the appellation of Plasmodium Malariæ is a misnomer). The parasite attaches itself to a red blood corpuscle, and ultimately leads to its destruction and formation of pigment. Inside the corpuscle the parasite undergoes various developmental changes. It is at first a clear amœboid body which, on gaining entrance into the corpuscle, becomes larger and shows a few scattered pigment granules. At a further stage segmentation is noted, and the parasite assumes a "rosette" form, with the pigment in the centre. The rosette breaks up and the spores are set free. They in turn attach themselves to corpuscles, and undergo a similar development. In the different types of malaria the number and form of the spores vary. The setting free of the spores is followed by a malarial attack. In the ordinary tertian form the parasite takes forty-eight hours to reach this stage; and thus attacks occur every second day. The quartan cycle takes seventy-two hours, with attacks every third day. A daily attack may be due to a parasite maturing every twenty-four hours, or to infection with two sets of tertian parasites maturing on alternate days. Crescents and flagellating forms are also seen. The crescent is a non-amœboid crescentic mass, with a central clump of pigment; the remains of the corpuscle may sometimes be seen as a delicate line joining the two horns. Crescents are found in æstivo-autumnal fever. The fully-grown parasite or crescents may develop delicate active flagellæ, which may became detached. Flagellæ are only seen in drawn blood. Manson thinks that this is the form the spores assume outside the body. Ross has seen this flagellation taking place in the stomach of a mosquito which has sucked malarial blood. The full cycle in the mosquito has not yet been made out, but as a mosquito fed on malarial blood can infect a man, it is now generally accepted that part of the life cycle may be spent in a mosquito. According to Ross, this intermediate host belongs to the genus Anopheles, which breeds on surface collections of water. By draining these he hopes to be able to stamp out mosquito-borne malaria.

Etiology.—Low, marshy regions, which have an abundant vegetable growth, and decomposing animal and vegetable matters, undoubtedly furnish the *materies morbi* of malarial fevers, which reaches its maximal period of potency not in summer or winter but in spring and autumn. Further, heat and moisture are essential for the development of the virus, which can be carried to some distance by winds. So carried, it appears to cling to the ground, for persons dwelling in the upper stories of a house, or in buildings elevated some distance from the ground, are exempt from infection in a marked degree. We may attribute the exemption we have now in our country from malaria to improved agriculture and better drainage.

1. *Intermittent Fever.*—The febrile phenomena occur in PAROXYSMS, ushered in by rigors, and terminate in a critical sweat.

There are three distinct stages—1, a stage of chill; 2, of heat; 3, of sweat.

The fevers are divided into types according to the length of these stages, for the attacks occur pretty regularly—every twenty-four hours (quotidian); every forty-eight hours (tertian); every seventy-two hours (quartan).

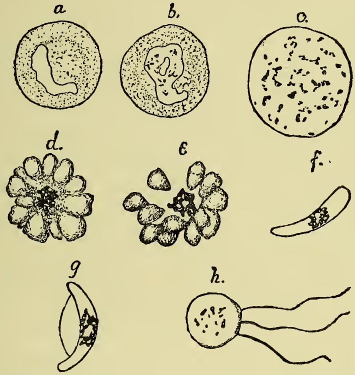

Fig. 5.—The Hæmatozoa of Malaria in the Blood.

a, Unpigmented amœboid body in a red blood cell; *b*, pigmented amœboid body; *c*, colourless discoidal body with pigment; *d*, segmenting body; *e*, fragments of segmenting body; *f* and *g*, crescentic bodies; *h*, flagellate body.

The time between the commencement of one paroxysm and the beginning of the next is termed the INTERVAL; that between the termination of one paroxysm and the commencement of the next the INTERMISSION.

The type most common in temperate climates is the tertian.

Symptoms.—The invasion may take place suddenly or after a few days of indisposition, with headache, loss of appetite, and sneezing.

The *cold* stage is characterised by chilliness first in the limbs, and afterwards over the whole body, by a sensation of streams of cold water running down the back, by shrivelled skin, "cutis anserina," chattering of the teeth, blueness of the nails, hurried respiration, and small pulse.

The duration of this stage varies from half an hour to three or four hours, and is succeeded by the *hot* stage or reaction, with increased temperature, dry skin, great thirst, frequent pulse, and a peculiar fulness about the head.

This hot stage usually lasts from three to four hours, but it may be prolonged to six, eight, or twelve hours, and is then followed by the *sweating* stage, beginning with a diminution of the heat, followed by a gentle moisture on the forehead and breast, and terminating in a copious, sour-smelling, steaming sweat, with an abundant flow of urine, normal pulse, and a cessation of all pain or uneasiness. The urine during the three stages mentioned varies; thus in the cold stage it is usually increased in quantity, clear and watery, of low specific gravity, and without sediment. In the hot stage it is voided, but sparingly; it is also red and of high specific gravity. In the sweating stage it is passed freely; it is of high specific gravity, rich in solid ingredients, and throws down a brick-dust sediment of the urates. This stage in its duration cannot be easily determined, but it appears materially to exceed the other two.

Treatment.—Persons going out to a malarial region should avoid being out of doors at night, the drinking-water should be boiled, and 10 grains of quinine should be taken daily. In the cold stage the patient should be placed in bed covered with blankets and rugs, with hot bottles applied to his feet, and hot drinks, such as tea or weak negus, should be given.

In the hot stage cooling drinks are required, and the body should be sponged with tepid or cold water.

In the sweating stage great care must be taken to prevent chills, and the action of the skin should be encouraged by tepid drinks.

Quinine being the great remedy in this fever, it may be asked, When should it be given? at what period of the fever?

and in what doses? and how long should it be continued? The answer to these inquiries may be thus summarised: It should be given DURING the INTERMISSIONS in a large dose, 20 to 30 grains, and at the CLOSE of the PAROXYSM, and repeated in 15-grain doses, with an interval first of one, then of two, three, and four days. Further paroxysms being thus averted, it should be taken for some months, not as an antipyretic, but in ordinary therapeutic doses. The reason why quinine is not given immediately preceding the paroxysm is that the stomach is apt to reject it, and it only aggravates what it fails to avert. The hypodermic injection hastens its action and may cut short the paroxysm, even though begun. The sulphate of quinine can be dissolved in tartaric acid in the proportion of 36 grains of quinine, 15 of tartaric acid, and half an ounce of water. So prepared it causes no pain on injection, and gives rise to no abscesses or other inconvenience. Each injection of 20 drops contains 3 grains of quinine. Ten minutes after injecting, the quinine can be detected in the urine, by the tests of the iodide of potassium, or the iodide of potassium and corrosive sublimate (F. 94). In the irregular manifestations of ague, evidenced by headache and neuralgia, arsenic is sometimes more serviceable than quinine. It is best given in the form of liquor arsenicalis, in doses of 8 minims two or three times daily after food.

2. *Remittent Fever* is endemic, non-contagious, and is chiefly confined to tropical climates. The different localities in which it prevails have led to its being designated by various names. It is thus called Walcheren fever, Bengal fever, BILIOUS REMITTENT of the West Indies, JUNGLE or HILL FEVER of the East Indies, African fever, Mediterranean fever, etc.

The symptoms resemble those of intermittent fever; it is distinguished from it, however, by the notable fact THAT IN ITS COURSE THERE IS NO ENTIRE CESSATION OF THE FEVER, BUT SIMPLY AN ABATEMENT OR DIMINUTION. The disease continues from twelve to fourteen days, and the period of remission varies from six to twelve or fourteen hours.

Symptoms.—The fever is ushered in by gastric symptoms, uneasiness, depression, and sinking at the epigastrium, with headache and languor. The cold stage is scarcely marked, or if so, is rapidly succeeded by a severe hot stage, with burning skin, vomiting, sleeplessness, intense headache, or even delirium. This stage, usually lasting the time mentioned, is succeeded by an indistinct stage of sweating or subsidence, and is followed by another attack similar to the first, but more severe. These attacks and varying remissions constitute the fever, which terminates in recovery or death, often in permanent ill-health. Occasionally there is jaundice, and the liver and spleen are enlarged and tender. The remissions usually set in during the morning, while the exacerbations take place towards the evening.

Treatment.—The object of treatment is to mitigate the exacerbations, and lengthen the remissions, and is based on the same principles as those indicated in intermittent fever. Thus, see that the bowels are acted on, sponge the body, or use the cold pack, and give effervescing and saline drinks. When the remission occurs, give quinine in doses varying from 4 to 6 grains every three hours, omitting the remedy when the hot stage commences, but resuming it at the next remission. Cold should be applied to the head if the headache is severe, and sinapisms to the stomach to relieve the gastric irritation. If there be much exhaustion, stimulants should be freely given.

At the termination of the disease the patient should, if possible, be sent to a temperate climate, or a non-malarious district.

3. *Pernicious Malarial Cachexia* presents three types—(*a*) comatose, (*b*) algid, (*c*) hæmorrhagic. Fortunately it is rare in temperate climates, and the different types need not be commented upon.

4. *Malarial Cachexia* may follow the frequent recurrence of ague, and after several months presents two striking features, viz. ANÆMIA and an *enlarged spleen.* In pronounced cases the anæmia is very marked. The blood corpuscles may be as low as one million per cubic millimetre; the skin has a saffron-yellow or lemon tint. The spleen is greatly enlarged, firm, and hard. It rarely reaches the dimensions of the large leuchæmic organ, but comes next to it in size, and this enlargement is known as the "Ague Cake."

The general symptoms are those of ordinary anæmia—breathlessness on exertion, œdema of the ankles, hæmorrhages particularly into the retina. The temperature varies as low for days as 99·5°. In other instances there may be irregular fever, and the temperature may rise to 102·5° or 103°.

With careful treatment, the majority of cases recover. The spleen is gradually reduced in size, but it takes a considerable time, months, or even years, before the Ague Cake entirely disappears. Even after his recovery the patient may be subject to recurrences of fever, which for their presence do not necessarily require new exposure to malarial influence: he seems to carry the seeds about with him, and the periodic character may imprint itself upon other diseases to which he is predisposed, as rheumatism or neuralgia.

Treatment.—Removal from the infected district is imperative, and internally the use of iron and quinine is required. Cold water in the form of a douche to the spleen does good. The ointment of the red iodide of mercury should afterwards be smeared over its surface, which is then exposed to the fire till it begins to smart. The use of the waters and baths of Homburg, Carlsbad, and the baths of Franzensbad are also recommended.

YELLOW FEVER

Yellow fever is an acute febrile disease of tropical and sub-tropical climates, and is characterised by jaundice and hæmorrhages. Sanarelli has described a bacillus which is probably the cause of the disease; it is sometimes epidemic, and unquestionably the poison may be conveyed by persons affected with the disease, or through infected articles. Though it affects all ages and both sexes, yet men are more frequently attacked, and the mortality is greater among them. One attack, as a rule, confers an immunity which persists through life.

Symptoms and Course.—The incubation is usually three or four days, but it may be less than twenty-four hours, or prolonged to seven days. The onset is sudden, often in the middle of the night, and is marked by severe headache, nausea, and vomiting, and a rapid rise of temperature, to 105° or more. The urine contains albumen about the second or third day, the conjunctivæ become yellow, and jaundice spreads over the body. On the fourth day there may be a remission of temperature, convalescence sets in, and the patient recovers in two or three weeks. But in many cases the temperature rises again, and the symptoms become more aggravated. The vomiting increases, and *black vomit* occurs. This consists of blood and gastric mucus altered by the acid secretions of the stomach. Bleeding may take place from the kidneys or from the gums, and hæmorrhages into the skin are not uncommon. The urine becomes scanty, and casts are present; and finally there may be suppression for days. Death occurs sometimes within a few hours of the onset, more often after the remission of fever, either from collapse, from profuse hæmorrhage, or from coma.

When six days elapse without the occurrence of black vomit, jaundice, or suppression of urine, hopes of recovery may be entertained. The mortality is usually one in three.

The symptoms of the fever point to the poison specially affecting the liver, which is supposed to undergo acute fatty degeneration. The poison is considered to produce certain specific changes in the blood accompanied by destruction of the red corpuscles. The blood thus loses its capacity for nourishing and regenerating the tissues, and when death does not take place there is a lingering convalescence, consequent on the feebleness of the whole organism.

Treatment.—We have no specific for the disease, and the treatment is thus symptomatic. It is of the utmost importance that the person attacked should not attempt to fight against the fever, but go at once to his bed, and take a large dose of castor oil with lemon juice. He should encourage perspiration by warm drinks and by plenty of blankets. If these means accomplish their ends, then symptoms must be met as they arise. Nausea and vomiting by ice to suck and by morphine injected subcutaneously in the epigastric region. The diet should consist of iced milk or barley water, and stimulants, as iced champagne or iced soda and brandy, should be given freely. No solid food should be allowed for at least ten days, and even then it should be taken with great caution and in a moderate quantity.

With the view of checking the growth of the bacillus in the intestine, Sternberg recommends ℞ Sodii Bicarb. grammes x., Hydrarg. Perchlor. centigrammes ii., Aq. Pur. litri i., M. —Sig. $1\frac{1}{2}$ oz. every hour, given ice-cold. Sanarelli reports favourably of the use of serum from immune animals.

Dietetics.—As soon as the stomach is able to retain food and drink, a light nutritious diet is essential, with wine. Citrate of iron and quinine aid convalescence.

DENGUE OR DENGÉ

is a peculiar exanthematous disease which has prevailed epidemically in Eastern Africa, British India, the West Indian Islands, and the Southern States of America. The epidemics invariably appear after long intervals, and they seem to originate independently of any antecedent case. After an interval of about fifty years, a great epidemic of Dengé originated in Zanzibar in 1870, and continued to spread in India till 1875.

Symptoms.—After a short, but indefinite, stage of incubation, the patient is suddenly attacked with pain and stiffness of the muscles, especially in the palms of the hands and soles of the feet, rendering every movement very painful. This is speedily followed by pain over the whole body, more particularly in the back, shoulders, and ankle-joints. After twenty-four hours there is swelling of the small articulations and severe pain on pressure. The febrile stage sets in immediately after the accession of pain, and is accompanied by a scarlet efflorescence appearing first on the face, which becomes swollen. The average duration of the febrile stage is about forty-eight hours, and this is followed by a period of remission of from two to three days. On the fourth day, the febrile symptoms reappear; and, on the fifth day, the peculiar exanthematous eruption, rubeoloid or urticarial, comes out, and spreads over the entire body within forty-eight hours, extending from the head and face to the lower extremities. When the eruption has become general, the lymphatic glands begin to swell, the occipital invariably; the mucous membrane of the mouth and nose is implicated, and sometimes the throat. On the fifth and sixth days, the symptoms reach their maximum of intensity; and on the seventh or eighth day, desquamation of the cuticle begins, and terminates as in scarlatina. Dengé is very rarely fatal.

Treatment.—It is almost always necessary to administer an active cathartic, as obstinate constipation is the rule. Quinine, in 5-grain doses, should be given, after the bowels have acted freely. When the febrile symptoms disappear, iodide of potassium, in 4 or 5 grain doses, should be given and continued during the period of remission and for several days after desquamation has been completed.

DYSENTERY

The rectum and flexures are chiefly involved. The mucous membrane is at first swollen and thrown into ridges from infiltration with leucocytes and serum. At a later stage hæmorrhage may occur and necrosis of the tops of the ridges. The sloughs become bile-stained, and on separating leave ulcers. Ulcers also form from swelling and suppuration of the solitary follicles. In tropical climates the liver is specially disposed to suffer, and ordinary or septicæmic abscesses may occur. So also the spleen or pancreas may be enlarged, softened, or indurated, and become the seat of abscess. The lungs may be similarly involved, and the bronchial tubes may be filled with puriform exudation, or fully-developed abscesses may be observed.

The site and extent of the ulcerations vary. The sigmoid flexure is a common site: the cæcum in certain cases and the rectum in others are principally implicated. In some severe instances the whole gut is covered with ulcers, while in fatal cases—Virchow's diphtheritic or gangrenous dysentery—the entire tract of the large intestine is a tattered mass of disorganisation, the natural appearance of the mucous membrane being lost. It is then covered with discoloured patches, with fibrous shreds, and commingled mucus, pus, and blood.

Dysentery not arrested in its early stage by treatment, and not rapidly fatal, is termed CHRONIC, and the condition is doubtless occasioned by structural changes in the bowel, *i.e.* thickening and imperfect cicatrisation of the ulcers and the permanently injured state of the glandular structures.

Dysentery may be either EPIDEMIC or SPORADIC. The former is peculiar to tropical climates, and the opinion is gaining ground that it is due to the action of various germs on the large intestine. Of these the principal is the *amœba coli* (Lösch), *amœba dysenteriæ* (Councilman). The amœba is a unicellular, protoplasmic, motile organism, from ten to twenty micro-millimetres in diameter, consisting of a clear outer zone, and a granular inner zone, containing a nucleus and one or more vacuoles. The amœbæ have been detected in the stools, in the intestines, and in the liver abscesses. In neither form is the disease contagious.

Symptoms.—Dysentery begins in both its sporadic and epidemic form with diarrhœa, after there have been irregular stools or constipation. There are also lassitude, want of appetite, and a listless attention to ordinary occupations. On the third or fifth day, usually in the night, the diarrhœa becomes more severe, and attended with shivering or rigors. Pain is felt in the abdomen. The desire to go to stool is intense. Little fæces after a time are passed, and there is a straining or burning pain at the anus and rectum (tenesmus). With the disappearance of the fæces there appears bloody mucus, or pure blood, in the midst of which are often seen little white lumps, or round pieces looking like minced raw meat.

The patient may seek to go to stool from twenty to thirty times in a night, and then, as might be expected, becomes giddy and faint from loss of blood and exhaustion. The disease may last in this acute form from six to eight days, with remissions in the morning and aggravations at night. As symptoms of amendment may be mentioned alternations of mushy, even formed stools, with the characteristic bloody mucous ones. In very severe cases the tenesmus increases; the dejections flow uncontrolled, and are largely mixed with blood, collapse sets in, and the patient dies of asthenia.

When the disease becomes chronic, it is very intractable, with frequent relapses, offensive discharges, and great pain and exhaustion. Sporadic dysentery generally terminates favourably. The mortality of the epidemic form may reach 40 or 50 per cent. In slight cases CONVALESCENCE is complete in about THREE WEEKS, medium severe cases in about SEVEN WEEKS. Severe cases, if they do not terminate fatally on the EIGHTH or NINTH day, may last an indefinite length of time.

Treatment.—During an epidemic of dysentery all unnecessary crowding should be avoided, and uncleanliness prevented. The discharges of the patient should be disinfected. Potatoes, salads, unripe fruit, greasy food, spices, or pickles, should not be taken; while ripe fruit and stewed apples are advantageous. Flannel bandages should be worn round the abdomen; and if the bowels are constipated a gentle laxative of rhubarb may be taken.

Should an attack of dysentery set in, the patient must remain in bed in a room of an equable temperature.

The remedy for Acute Dysentery is ipecacuanha. It cuts short inflammation, and it promotes repair, when inflammation has occurred, by granulation and cicatrisation of the ulcerated intestine. Further, it conserves the power of the constitution, and shortens the time required for convalescence. It decreases the frequency of chronic dysentery, and minimises the danger of abscess of the liver. It has notably lowered the mortality from the disease since it has been adopted in the Anglo-Indian practice. Thus—

In the Bengal Presidency it has fallen from 88 per 1000 to 28.

In the Madras Presidency it has fallen from 71 per 1000 to 13·5.

The treatment by ipecacuanha is appropriately initiated by the administration of a simple tepid water enema of from two to four pints. This clears away any fæces, and leaves the intestine ready for the special treatment, which consists of 30 grains of pulv. ipecac., with 10 grains of sodii bicarb. to counteract acidity, and ℥ss. of syrup aurantii to cover the taste. Should this draught be rejected, it should be repeated when the stomach becomes tranquillised. The patient after this dose must remain perfectly still, and for *three hours* refrain from drinking, but he may be permitted, if thirsty, to suck a little ice, or take occasionally a teaspoonful of water. Griping is relieved by placing over the abdomen spongiopiline wrung out of hot water, and sprinkled with turpentine. Arrowroot made with water may be given at the expiry of the time mentioned, or milk or iced gruel. In from eight to ten hours the ipecacuanha should be repeated in a 20-grain dose of the powder, and it is advisable to continue the remedy in diminished doses for some days; and even after the stools are healthy, to administer 10 to 12 grains at bedtime for a night or two. As a rule the system is tolerant of the large doses, and vomiting does not occur. Surprising effects follow shortly on this treatment—the tormina and tenesmus subside, blood disappears from the motions, profuse perspiration sets in, and a refreshing sleep is enjoyed. The *diet* should consist of milk, soup, and the yolk of eggs, so that small, not bulky, motions may be formed. It has been lately stated that in the earlier stages of dysentery a saturated solution of sulphate of magnesium is very effective. The method of administration is to take a sufficient quantity of sulphate of magnesium to saturate seven fluid ounces of water, and to this saturated solution add one ounce of dilute sulphuric acid. A drachm of this solution is given every hour or two, until its effects have been manifested in the feculent character of the stools, and their freedom from blood and mucus; or until the temperature has fallen, and the pain and tenesmus have ceased. Then an ordinary astringent mixture of dilute sulphuric acid with tincture of opium is usually all that is necessary to complete the cure. It is imperative to diet the patient with great care. This mode of treatment is specially advocated in cases where ipecacuanha causes great nausea and vomiting and nervous depression, but it is very questionable if, except in such cases, it should be adopted. American observers recommend irrigation of the lower bowel with astringent injections.

If through lack of efficient or neglect of any treatment *Chronic Dysentery* ensues, the best remedy is a change of air; a sea-voyage often acts admirably, and an afflicted and broken-down patient after the expiry of a week or two becomes convalescent. Ipecacuanha may also be prescribed in gr. x. doses, or a teaspoonful of the liquid extract of bael. Trousseau recommended subnitrate of bismuth in gr. x. doses, or a mixture of kino and catechu. Others speak highly of opium enemata (F. 22); or of a combination of sulphate of iron, glycerin, and water. Every imprudence in diet, or exposure to cold, must be studiously avoided; *e.g.* the clothing should be warm, with a flannel bandage worn over the abdomen, and the food taken must be bland and nutritious, so that no flatulence or indigestion may result.

Mineral Spas.—Spa, Franzensbad, Tarasp, and Marienbad can be recommended in chronic dysentery.

GLANDERS—*Variety*, FARCY

Etiology.—Glanders is a disease of the horse and some animals allied to it, as the ass and mule. This disease can be transferred to man by infection, usually from the pus and nasal secretions of diseased animals. A little of this secretion falls upon some excoriation or crack on the hand and is absorbed. The disease-producing agent is found to be a bacillus 2 to 3 μ long and 0·3 to 0·4 μ broad, often carrying a spore at the extremity. It is found in the farcy buds and ulceration of Glanders, and also in the blood of persons suffering from this disease. These bacilli can be reared artificially, and if inoculated on horses and other animals give rise in every instance to typical glanders. Fortunately the disease is rare, and when it occurs it is among men attached to stables, as coachmen or grooms.

Symptoms.—Three to five days after infection local signs are seen at the seat of the injury. These consist of swelling and lymphangitis with pain. Then follows grave constitutional disturbance evidenced by headache, fever, and pain in the limbs, while pustules and abscesses break out in different parts of the body. The nasal mucous membrane is the seat of ulcers, and from the nose there flows a foul-smelling discharge. The throat and larynx are also implicated with inflammation and ulceration, which spread to the bronchi, and diffuse bronchitis sets in, with vomiting and diarrhœa. The fever is high, the pulse rapid and small, and the patient becomes delirious and comatose. Death occurs at the end of two to four weeks in acute cases, but occasionally a chronic form of the disease is seen, with milder constitutional symptoms, which, after a protracted illness, ends in recovery.

Treatment.—In acute glanders we can only palliate; for the case from the first is hopeless. Abscesses should be opened, and the nose, mouth, and throat disinfected with antiseptic lotions of salicylic acid or permanganate of potassium, and generally quinine and stimulants are given in large quantities. In the chronic form iodide of potassium and nutritious diet are advisable.

SPLENIC FEVER

Synonyms, Wool-sorter's Disease, Charbon, Anthrax
Variety, Malignant Pustule

Splenic fever affects horned cattle, sheep, horses, and birds, in all parts of the world. It may commence by the formation of a pustule of a carbuncular nature, but usually, especially when the disease is rapid in its course and the animal is particularly liable to it, no pustule is observed. Sometimes animals are struck down when apparently well, but generally the temperature rises, they stagger, bleed from the nose and mouth, and quickly die. In the blood of men and animals suffering from anthrax, bacilli are found. The number of these bacilli as seen in man falls far short of that witnessed in the case of animals, and it varies according to the part from which the blood is taken. It is found most abundantly in splenic blood. The bacilli are motionless, rod-like bodies 5 to 12 μ long and almost uniformly 1 μ broad, slightly thickened at the extremities, and occasionally having the appearance of transverse segmentation towards the middle. They are found in the blood drawn from the body, and in the organs of animals which die of anthrax. They can be isolated and cultivated, and then produce infection. The bacilli live only a comparatively brief time when taken from the blood, but the spores have a great tenacity of existence. They may remain dried up for years, and when placed in favourable conditions, as to heat and moisture, they are brought to further development. If transferred to animals the spores develop into bacilli, and there can be little doubt that men and animals are as often infected by spores as bacilli. Direct inoculation in most cases infects human beings. Thus shepherds, farmers, and butchers, coming in contact with animals suffering from anthrax, are liable to infection through any little wound or scratch on the hands. Often the disease is caught by wool-sorters, wool-pickers, horse-hair cleaners, furriers, and tanners, who from their occupations have to deal with wool and hair of animals who have died from the disease. It is not likely that the virus can be absorbed by the unbroken skin or by the lungs, but it has been demonstrated that the intestine may afford ingress to the infectious matter, and that eating the flesh of an infected animal will bring on anthrax in man.

Clinical History.—Two distinct forms of anthrax in human beings are recognised.

1. Malignant pustule or carbuncle proper appears on the hand, the arm, or the throat, as a red pimple, in from three to seven days after infection. A vesicle forms from the papule. It grows rapidly and becomes excoriated, and has usually an appearance of a brown eschar seated on a dark blue base, surrounded by a ring of clear vesicles. Swelling of contiguous parts is observed, while inflamed lymph-vessels or veins radiate from the pustule, and the neighbouring glands are affected. Healing of the pustule may take place by sloughing, or by the eschar separating and the wound granulating, but in one out of three cases grave constitutional symptoms are manifested by great prostration, fever, delirium, diarrhœa, and coma. Death may ensue after a few days' illness.

2. In internal or intestinal anthrax the cutaneous disorder, if it exist at all, is marked by severe constitutional symptoms. It is ushered in with a chill and vomiting, which are succeeded by a moderate, painless, sometimes bloody diarrhœa, impeded respiration, and generally rapid collapse. The temperature is usually little elevated. In a few days death ensues. When anthrax affects the lungs we may have great weakness, rapid pulse, high rectal temperature, with physical signs of acute pneumonia or bronchitis.

Pathology.—In fatal cases dark infiltrated spots, with hæmorrhages, are seen in the mucous membrane of the small intestine, and sometimes in the upper part of the colon. The spleen is enlarged, dark, and congested. The lymph-glands are swollen, and there may be ecchymoses in the kidneys, the brain, and the serous membranes. The specific bacilli are found in all the parts mentioned.

Treatment.—The treatment of malignant pustule in the early stage is by excision or cauterisation with nitric acid or caustic potash. Subsequently the local treatment consists in the use of ice, rest, and elevation of the part. The general treatment is stimulant, quinine and alcohol being given largely.

Prophylactic measures, from the nature of the disease, are strongly indicated, and the carcases of animals dying of anthrax should be thoroughly destroyed by fire. The law in France and Germany is stringent; in Britain it is much less rigorously enforced. Pasteur's experiments show that if the bacilli of anthrax are kept under cultivation for several weeks at an unchanging temperature of 106° F., they gradually lose their power of infection, although their external appearance is not changed. Inoculations made with the virus so cultivated produce little or no mischief, and it is affirmed that animals so inoculated are not affected when exposed to infection with real or unattenuated anthrax.

HYDROPHOBIA—*Synonym*, Rabies

The term hydrophobia was first used by Celsus, and simply expressed one prominent feature of an affection the pathology of which has ever remained obscure, viz. dread of water, or, it may be added, of liquids in any form. The disease is the result of the implantation of a specific virus, the inoculation taking place most frequently from the bite of a rabid animal, especially the dog. The skin must be wounded; the spontaneous development of the disease is never known. Wounds so occasioned are more dangerous on the hands and face than on the lower extremities, probably because the clothing worn intercepts the virus.

After the infliction of the wound there is a stage of incubation, varying from six weeks to as many months, during which time the wound heals perfectly. After this a peculiar prickling sensation is felt over the site of the cicatrix, accompanied with general symptoms of restlessness, depression, and disturbed sleep. On these supervene the terribly significant phenomena of dread of liquids and intense thirst. As the disease progresses all attempts to drink are avoided. The sight even of a drinking-vessel containing water is intolerable, and the patient turns away his face, shrieking out at the slightest touch or breath of air. The muscles of the neck and trunk, and even the whole muscular system, contract spasmodically, with convulsive trembling of the limbs; at times, during the frenzical fits, snapping motions are made with the jaws, like biting. Although during the convulsions mental hallucinations occur, yet, in the temporary cessation from these, the patient responds correctly to questions, begs friends not to leave him, and, with a consciousness of impending death, may ask them to pray for him. The saliva is now greatly increased in quantity, and, as it cannot be swallowed, is ejected in all directions. The respiration is hurried, and accompanied with a sighing sob. This state may continue from one and a half to three days, and is succeeded by a stage of paralysis lasting from two to eighteen hours, with an abatement of the distressing symptoms, but with greatly increased weakness, which deepens into death. The skin is covered with a clammy sweat, pulse is small and irregular, saliva runs from the mouth, and breathing is accelerated.

The duration of the disease in hydrophobia is only from two to four days.

Treatment.—Pasteur's Treatment has rescued hydrophobia from the domain of incurable diseases. The principle of this method will be understood from what follows:—

1. From a bite of a rabid dog, and by the insertion of the saliva into the flesh, the poison of rabies is introduced into a human being. By the blood it is carried to the nervous centres of the brain and spinal cord, and after a certain period of incubation the symptoms of hydrophobia appear. If a portion of the brain or spinal cord of a rabid dog is placed, after trephining, under the dura mater of a rabbit, rabies develops in about fifteen days. But the virus so communicated can be intensified in virulence, and to accomplish this the virus from the first rabbit inoculated is communicated to a second, from a second to a third, and so on until at the end of the fiftieth inoculation the incubation period is only seven days, and spinal cords, with a varying

degree of virulence, are obtained rabic throughout their whole extent.

2. From one of these rabbits the spinal cord is taken, with due antiseptic precautions, and is suspended in dry air. The virulence, slowly disappearing, is finally abolished, and in this way the cords of rabbits can be had weak or strong with the rabic poison.

3. Bouillon is mixed with a fragment of cord, not in a very virulent state, and is injected under the skin of a dog. After an interval usually of two days, injections from more recent and therefore more virulent cords are used, until a time is reached when a portion of a very virulent cord is injected, *i.e.* of a cord which has been kept in the dry air for only a day or two.

4. The result is that the dog is completely protected. No symptoms of rabies can be produced either by the direct bite of a rabid dog or by the injection of rabic matter. Pasteur so experimented with fifty dogs without a single failure, and then he considered he would be justified in trying the experiment on a human being who had been bitten by a rabid dog.

5. The 6th of July 1885 saw the beginning of the cure of hydrophobia. An Alsatian boy (Joseph Meister), who had undoubtedly been bitten by a rabid dog, and whose condition was such as to justify the supposition that hydrophobia was incubating in his system, was brought into the laboratory of Pasteur. Half a syringeful of bouillon in which a cord had been mixed after a drying of fourteen days was injected on the 6th, and on succeeding days injections were made from cords which had been kept for shorter periods, until at the end of ten days half a syringeful was injected of a cord which had only been kept for one day.

6. The experiment was successful. Joseph Meister did not take hydrophobia, and now the mortality from this previously incurable disease is reduced to a very small percentage. The Royal Commission sent out by our Government has fully corroborated the statements of Pasteur, and has given a highly favourable report, after long investigation and careful consideration of the issues involved.

TETANUS—*Synonym*, LOCK-JAW

Experimental research has now shown that tetanus is a traumatic infective disease caused by a specific bacillus. These bacilli or their spores are found in garden earth, in the mud in streets, in horse-dung, and in other situations. They require certain conditions, such as the exclusion of oxygen, and a suitable nutrient medium and temperature, for their growth. When such conditions are realised, as, for instance, in a contused wound, they find a suitable nidus in the damaged tissues, which provide a proper nutrient medium at the right temperature. Here they are shielded from the oxygen of the air by a layer of pus, and from the oxygen of the blood by a layer of damaged tissues, in which the blood-flow has been arrested. They do not spread into the circulation, but the poisons which are produced from the bacilli enter the blood-stream and act on the nerve-centres, setting up the violent muscular spasms which are characteristic of the disease. The *bacillus tetani* is a rather long, slender, mobile germ, prone to develop a spore in one end, under which condition the bacillus swells at the end and becomes drumstick-shaped.

Symptoms and Course.—After an injury the disease usually sets in within ten days. The first symptom is rigidity of the abdominal muscles, and pain in the epigastric region, extending backwards to the spinal column, and due to spasm of the diaphragm. Succeeding this are stiffness of the throat, fixedness of the jaws, and difficulty of swallowing. Sooner or later there follows tonic, *i.e.* continuous, spasm of the neck, back, and loins, causing the body to assume the form of an arch (opisthotonos) supported on the head and heels. The skin is hot, the temperature high, from 105° F. to 110° F.; wakefulness, thirst, and constipation are also prominent symptoms. Strychnine poisoning may be mistaken for tetanus, but it is distinguished from it by this, *that there is no epigastric pain, spasms are more rapidly developed, and do not commence in the jaw.* The average duration of the disease is from three to five days. Hopes of recovery may be entertained if it extends over a week. Death results from apnœa or exhaustion.

Treatment with the antitoxin obtained from the serum of immunised animals has on the whole not proved very satisfactory. In many instances recovery has occurred in cases in which it has been employed, but in quite a large number of cases where it has been used early and freely it has been unable to avert a fatal issue. It has been suggested that the serum does not come into sufficiently intimate connection with the central nervous system, and accordingly attempts have recently been made to increase its neutralising power by trephining and injecting the serum into the brain. In some cases this procedure has proved highly satisfactory. It must, however, be clearly understood that quite a large percentage of cases recover under treatment with chloral hydrate, physostigmine, and chloroform. Probably our best course, then, would be to open up or excise the scar, and, if necessary, amputate. If we can obtain antitoxin we may inject it. Failing antitoxin we fall back on chloral hydrate and spinal depressants. Generally speaking, if the patient survives the first week the prognosis is fairly good.

SYPHILIS

Syphilis is a chronic infectious disease, with different symptoms at different stages of the malady. As a separate and distinct disease, syphilis dates from the end of the fifteenth century, when a notorious epidemic of it occurred in Italy, which gradually became less malignant; and the physicians then inferred, falsely, as we now know, that it would wear itself out, and cease altogether to infect the human body. The disease is at the present day prevalent throughout the world, although its principal sites, for obvious reasons, are large seaport towns and great commercial centres.

The term "syphilis" seems to have been invented by Fracastorius, who in 1521 published a poem, in which he related how Syphilus, a shepherd, was stricken by Apollo with the new disease, which even then was not considered venereal. The most common designation for it was "lues venerea," which dates back to the time of Fernelius (1556); and this "lues venerea," or venereal disease, was held to include gonorrhœa and soft chancre. Ricord in 1831 established the distinction between them. Indeed, the conception of syphilis as a general malady, comparable with the exanthemata, had no existence until forty years ago.

It is generally held that the disease is caused by micro-organisms. There is still, however, considerable doubt whether the bacillus described by Lustgarten is the real cause of the disease.

Course of the Disease.—*Incubation.*—There is a period of incubation in syphilis as in the acute contagious fevers; and it is strange that this fact, now so well known, should have been so long unrecognised.

Primary Stage.—The earliest symptom of syphilis is manifested at the seat of infection. It is called the primary lesion, while the more remote symptoms, which appear elsewhere and at a later period, are termed secondary. It appears as a flat red papule, at first small, soon increasing in size, and as it grows larger it becomes indurated, forming a hard base. After a week or two it may desquamate slightly, or thin moisture may leet from its surface, which afterwards dries into a scab; or it may continue to look shining and glazed; or it may become excoriated and slightly depressed in its centre. Then follow, a few days later than the primary lesion, swelling and induration of the lymphatic glands in the groin when the genitals are the primary seat of infection, or of the glands of the axilla when the indurated sore appears first on the finger, or if on the lip those near the lower jaw. They do not suppurate. They feel hard, freely movable, and are seldom tender or painful. In these glands the virus multiplies for six or seven weeks, and then appears the *Secondary Stage.* This is ushered in by constitutional symptoms which vary;—sometimes with fever, sometimes with neuralgia situated in the temples and subject to nightly exacerbations, sometimes with swelling of the large or small joints. The syphilitic eruption appears on the skin generally in the form of rose-coloured spots, hardly raised above the surface in the early stage, disappearing on pressure. The chief seats of this eruption are upon the sides of the chest and abdomen, but sometimes it appears on the whole of the trunk—the neck and face being rarely attacked—or it may be seen as small dry elevations or papules (lichen), or as pustules (acne). Following on one of these primary eruptions there may develop a scaly or a vesicular eruption, the seat of which may become pigmented.

Concomitant Early Symptoms.—The fauces become early affected with swelling of the tonsils; the swelling being followed by small milk-white spots similar to those left by the application of Nitrate of Silver to a mucous membrane. These spots may invade the palate, lips, and inside of the cheek. On moist parts mucous patches and condylomata develop.

In cases of severe forms of eruption the eyes may suffer within six months of the appearance of the disease. The affection is termed Iritis. It is usually bilateral, and may have a painless insidious origin. The lymph-glands above the elbow, and at the back and side of the neck close to the occipital bones, also enlarge. Frequently, also, there is a "failing of the hair," which sometimes proceeds to baldness.

Later Symptoms.—After the lapse of six months the disease, properly treated, may take a favourable course, with disappearance of the symptoms and restoration to health in from ten to twelve months from the time of infection. But in most cases new crops of eruptions come and go on the skin and mucous membranes; and thus we observe small papules on the tongue, and scaly isolated patches of psoriasis on the palms of the hands, or other parts of the body. If the constitution be weak and scrofulous, eruptions difficult to heal may form.

Severe ulcerations may also be developed in the throat and nasal cavities, in which latter the bones may be laid bare and the nose become permanently depressed. Tumours may form in various internal organs, especially the liver, the testicles, and the brain, and from the semi-translucent aspect which they present, especially in the quite recent state and at the growing edges, they have been termed "GUMMATA." These "gummata" are not of the nature of an exudation, but consist of hyperplasia, increase of connective tissue elements. This increase begins in the walls of the vessels, and although at first soft and translucent, it afterwards becomes firmer and tougher, and dries up. Phthisis may now begin, with albuminuria and dropsy due to amyloid degeneration of the kidneys.

Constitutional syphilis may also be communicated from local secondary lesions, as by kissing, etc., by syphilitic nurses, by vaccination when blood is taken along with the lymph of the vaccine vesicle, etc.

The syphilitic cutaneous affections may be of various kinds; probably the squamous variety is the most common, appearing in patches of a coppery colour, and having the scurf renewed as fast as it is shed.

These eruptions may generally be diagnosed as syphilitic by the fact that they do not itch; by their dull coppery colour; by their more or less circular form and grouping; and by the brownish coloration the severer forms leave behind. Syphilis is often communicated to the infant through disease of either parent. In such cases, within a few weeks or months, an examination of the nates will reveal mucous tubercles, or red patches at the buttocks, ankles, or hands. Fissures may also be observed at the lips, nose, or angles of the mouth. The child also presents, if no treatment has been adopted, a pinched, young-old appearance; the skin hangs in loose folds, and there is a history of characteristic snuffles from birth, accompanied by a peculiar hoarse cry. As the result of this congenital syphilis the upper central incisors of the permanent teeth are peg-shaped and notched, and one or both eyes may be affected with a lingering inflammation of the cornea (Keratitis), which appears like a mirror which has been breathed on.

Treatment.—It is doubtful if the initial lesion can be destroyed at the seat of infection, opinions varying on this important point. Experience testifies that all treatment of constitutional syphilis is futile without the aid of mercury. There are four modes of employing it:—

1. By inunction. A drachm of the oleate of mercury or of unguent hydrarg. should be rubbed in every night over the sides of the chest and abdomen, or the inner aspects of the arms and thighs, after washing the part selected with soap and water. Inunction should be stopped whenever the mouth becomes in the slightest degree affected.

2. By hypodermic injection of the perchloride. There

are different ways of doing this. My experience leads me to recommend dissolving 2 grains of the perchloride in 60 minims of water. Then add to this solution 40 minims of a filtered mixture of one part of white of egg and two of water. An albuminate of mercury is formed, which again is rendered soluble by the addition of a small quantity of a saturated solution of chloride of sodium. A clear solution is thus obtained, which should be made up to 144 m., and of this 3 minims may be injected twice daily, equal to $\frac{1}{24}$ of a grain of the perchloride. This injection causes no pain and is followed by no inflammation. Mr. Bloxam recommends as an injection a solution of sal-alembroth—a double chloride of mercury and ammonium (F. 2*a*). The dose is 10 m. = $\frac{1}{3}$ grain of mercuric chloride. After two injections the physiological action of mercury is produced, and can be maintained by an injection once a week. An injection is *then* made every fortnight, and, when the glandular and throat symptoms have disappeared, once a month. This is continued from fifteen to twenty-three months. Lately a solution of gluten-peptone sublimate has been prepared, and can be obtained from pharmacists. 1 cg. (nearly $\frac{1}{7}$ grain of perchloride) is the dose for one injection. By any of these methods, the symptoms of the disease, local and constitutional, undergo a rapid and favourable change, and the amount of perchloride used in individual cases is very small, only 6 to 8 grains. The most appropriate site for the albuminate injection is into the connective tissue beneath the skin between the shoulders, or into the muscles of the gluteal region for Bloxam's solution, and the solution of the gluten-peptone sublimate.

3. By fumigation. Calomel is used. The patient, who is naked, sits on a cane-bottomed chair; a blanket, which reaches to the floor, is fastened loosely round his neck; 20 grains of calomel are placed in a porcelain dish over a spirit lamp under the chair. The calomel volatilises, and is absorbed by the skin. A bath should last twenty minutes and be continued daily until slight mercurialisation is produced.

4. By a mercurial preparation internally. The principle here is to select one which can be continued for the greatest length of time without producing digestive derangements or

causing salivation. Hydrargyrum c. cretâ 1 grain, three times a day, or the perchloride $\frac{1}{16}$ grain in the form of a pill, or in a mixture (F. 1, F. 2), are favourite remedies in this country. German authorities highly and justly recommend Zittmann's decoction, which contains sarsaparilla and other herbs, as the vehicle for the administration of the perchloride, and as aiding its action. The internal administration of mercury should be continued for six months at least, and then iodide of potassium should be given alone for a considerable time afterwards.

In *tertiary* manifestations of syphilis iodide of potassium is specially serviceable. If there is much anæmia it may be combined with carbonate of ammonium, or ammonio-citrate of iron. In some cases it is advisable to use Donovan's solution (F. 3). Condylomata are best treated locally by dusting calomel or iodoform over them. Congenital syphilis can be treated successfully by small doses of hydrarg. c. cretâ, as ½ grain three times a day for several days; then the same dose once a day may be continued for some weeks. Instead of hyd. c. cretâ we may use mercurial ointment. A flannel roller, smeared with this ointment, is wound round the abdomen. The movements of the body rub in the mercury as in the ordinary operation of inunction. The child must either be nursed by the mother or else brought up by hand, as it will infect a healthy wet-nurse. For keratitis, my experience at the Glasgow Eye Infirmary induces me to speak highly of small doses of hydrarg. c. cretâ and quinine, with the local application at first of atropine and subsequently of dusting with calomel.

In considering the different ways of getting mercury into the system, it seems to me advisable to state that my personal experience is in favour of the inunction or the injection method. By both methods the remedy is rapidly absorbed, easily eliminated, and there is little risk of producing salivation. The injection has the advantage over the inunction in being more cleanly, and its action more accurate and speedy.

Some cases of syphilis seem to resist all treatment at home, and in these cases the patient should be recommended to proceed to Aix-la-Chapelle or Neuenahr. Undoubted and permanent benefit ensues from the inunction of mercury assisted by the sulphur baths at these spas. In six weeks a cure may be accomplished.

Diet.—The diet should be nourishing; beer and wine may be allowed, but no spirits. The teeth should be brushed daily with tincture of myrrh or with a solution of chlorate of potassium. The patient should wear flannel, avoid sudden changes of temperature, and go to bed early.

TUBERCULOSIS

By tuberculosis we understand an infectious disease, characterised by the formation of small nodular bodies known as tubercles, gray in colour, varying in size from a millet seed to that of a hemp seed, and dependent upon the presence and growth of the tubercle bacillus. The yellow tubercle is only an advanced stage of the gray or miliary tubercle.

The widespread nature of tuberculous disease is evidenced by statistics which show that in some towns it causes 25 per cent of the death-rate, while all over the world it causes a mortality equal to one-seventh of the classified forms of disease. It also exists to a varying extent among animals. Notably it exists among bovines, from which class we derive nearly all the milk and a very large proportion of the meat used for food.

The Bacillus Tuberculosis.—In 1882 Koch announced his discovery of a specific bacillus as the one and only cause of tuberculosis. His statement, though at first questioned by some, has now been accepted as absolutely correct. The bacilli are about $\frac{1}{4}$ to $\frac{1}{2}$ of the diameter of a red blood corpuscle, have rounded ends, and are *usually slightly bent.* For the most part they occur singly, or united in short threads, or heaped together in thick masses. They have no power of locomotion. For favourable growth they require a nidus closely resembling the body, such as blood serum, and a temperature maintained for about two or three weeks at about 37·5° C. They cease to grow at temperatures below 28° C. and above 42° C.

A pure cultivation may be introduced into a susceptible animal by subcutaneous injection, or into the anterior chamber of the eye, or into the peritoneal cavity, or into a vein, or by inhalation; and in from two to four weeks the disease makes its appearance, the tubercles being generally most numerous near the place of inoculation. A specific local inflammation and general rise of temperature are produced. It is not to the bacilli alone, however, that the constitutional symptoms are due. When in contact with the tissues, they secrete a chemical poison or toxin, and not a few of both the local and general reactions are supposed to be due to this substance. If, however, the bacilli have been introduced directly into the blood, a general miliary tuberculosis ensues. That the bacilli do not lose their virulence when cultivated outside the body is shown by the fact that Koch can as certainly bring about Tuberculosis with a cultivation which is the eightieth in an uninterrupted series of generations of pure cultivations as with bacilli taken directly from a tuberculous animal.

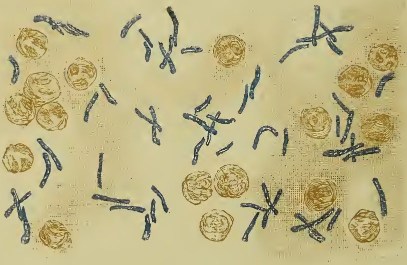

Fig. 6.
Tubercle Bacilli from the Sputum.

The bacilli may be found in all the tissues and organs of the body, but they are most numerous in the lung, brain, liver, and spleen. They multiply by the formation of spores, whose vitality has been found uninjured by drying for 184 days. Probably infection occurs most frequently through the instrumentality of spores given off in the sputum. This, drying, is converted into dust, which, floating in the air, is inhaled during the respiration, and so the spores find a lodgment in the lung. Infection also readily occurs by the milk of a cow suffering from tuberculosis, and to a lesser extent by the meat of tuberculous animals.

As soon as the bacilli have found a suitable nidus, they attract leucocytes from the blood-vessels, which surround them and to a certain extent englobe them. A chronic inflammation in fact is set up, and the fixed tissue cells round the bacilli proliferate. The cells from these sources form a nodular mass, which is hard, gray, and non-vascular, and about the constant size of a mustard seed. This nodule is called a tubercle. The tubercle thus formed undergoes further changes. The cells in the centre either coalesce or else attain an inordinate size, forming what is known as a *giant cell.* The giant cell has fibrous processes (supposed to be secreted by the cell) which spread out in the tubercle. The formation of the giant cells is regarded as a means of defence, for dead tubercle bacilli are often found in their interior, and sometimes the bacilli are buried in a calcareous mass, which forms in the giant cell. As the tubercle gets older it undergoes still further changes; notably when a number of tubercles are formed at a focus they coalesce, and in the majority of cases undergo a *caseous degeneration.* This is in certain respects an unfavourable course. The tubercular mass becomes converted into a dry, yellow cheesy substance; but whether this is due to absence of blood, or to the specific action of the bacillus poison, it is difficult to decide. In all cases the caseation begins in the centre of the tubercles. Finally this caseous mass softens, and forming an infective focus, spreads the disease by the lymphatics and veins to parts near or distant, and sometimes may even cause a generalised tuberculosis.

But caseation does not always occur. In favourable cases, when the constitutional vigour is greater, the tubercles undergo a *fibrous transformation.* This is effected by the development throughout the tubercle of a fibrous reticulum, which increases and converts the nodule into a sclerous encapsulated mass. The tubercle is to all intents and purposes dead, and is incapable of originating further infection.

Further, *pus*, *fibrin*, *serum*, *epithelial cells*, *connective tissue*, and indifferent tissue are all found in varying quantities, either separately or together, in those parts of the body where tubercular lesions have been developed.

Age.—While no age is exempt from tubercles, yet they most often occur in childhood and early adult life.

Seats.—The mucous membranes and the serous membranes are most commonly affected with tubercles. They are also observed in the pia mater. As regards organs, tubercles chiefly attack lymphatic glands, lungs, liver, spleen, kidneys, and skin and bone. They are rarely seen in the heart, salivary glands, pancreas, mamma, ovaries, thyroid gland, or voluntary muscles.

Tuberculosis is in nearly every case an acquired disease. Hereditary transmission by means of the sperm, ovum, or through the placental circulation, is possible. Congenital tuberculosis is, however, very rare. Baumgarten thought that the bacilli may be present at birth and remain latent till some local diminution in the resisting power of the tissues allows them to become active. The theory most generally accepted is that a predisposition to tubercle, in the form of a lessened power of resisting tubercular infection, is all that is inherited. This, as they are constantly exposed to infection, explains the prevalence of tubercle among the children of tubercular parents. In, however, over 50 per cent of all cases there is no family history of tubercle. Various circumstances favour infection. Thus the disease is most prevalent in towns and institutions where the hygienic conditions are bad and there is undue crowding. In many cases tubercle seems to cling to a house so that successive healthy families coming to live in it become tubercular. Since the time of Hippocrates it has been noted that people of a certain bodily type are specially liable to tubercle. Thus the "habitus phthisicus," where the thorax is long, narrow, and flat, with prominent winged scapulæ, is associated with phthisis pulmonalis. Such individuals usually have a delicate white skin and fine silky hair. The scrofulous type is also recognised as one in which the tissues are specially liable to tubercular invasion. The individuals of this type have a much coarser and less clear skin. The lips are thick;

the nose often flattened and broad, and they are frequently affected with enlarged glands. The influence of age is not very marked. Tubercle is common at all ages, though the individual organs affected vary with the different periods of life. Sex has little influence. Occupation is a much more important predisposing cause. Dusty trades, especially if carried on in close ill-ventilated rooms, are specially liable to cause phthisis. Thus mill hands, factory workers, glass-grinders, stone-cutters, etc., all are specially liable to the disease. Previous disease, especially pulmonary catarrh, or an attack of measles and hooping-cough, often proves the starting-point of tubercular disease; while trauma is a frequent cause of tubercular joint affections.

Treatment.—Prophylactic measures are necessary in tuberculosis. 1st, The sputa of phthisical patients in hospital and private practice should be collected and carefully destroyed. In all public places, such as railway stations, railway cars, etc., suitable vessels should be provided to receive the sputa. Dairies should be inspected and tubercular cows destroyed. Beef of tubercular cattle should not be exposed for sale, and the person wilfully selling this should be punished by imprisonment without the option of a fine. A phthisical patient should sleep alone. 2nd, Marriage should not be contracted by those who have tuberculosis in any form. 3rd, If marriage has, however, been contracted, such children as are born when there is evidence of this disease on the part of one or other of the parents should be entrusted to a healthy wet nurse, and be much in the open air both during and after lactation. After lactation, if circumstances permit, these children should be sent to a dry and equable climate until the constitution is well developed. They will thus be enabled to spend much time out of doors without risk of catching cold, and thus obtain the most important hygienic factor—daily exercise in a pure atmosphere. On the same principle, when the child has become a young person, a timely sea-voyage is of great benefit. The appetite and digestion are thus improved, the constitution is hardened, and the general health benefited. For those who cannot obtain such changes, we must trust to cod-liver oil given up to two or three tablespoonfuls daily; and to salt-baths, conveniently made from Tidman's sea-salt. If the glands of the neck are enlarged, iodoform collodium may be applied, or the overlying skin touched with tincture of iodine, while syrup of the iodide of iron and cod-liver oil are taken internally. Opening of abscesses and extirpation of glands belong to surgical more than medical practice. Brine baths, as at Kreuznach, Kösen, Reichenhall, and Münster and Stein, have in such affections a deserved reputation. There is no specific against tubercle. Koch's tuberculin, cantharidinate of potash, and cinnamic acid are unreliable. Our best aim is, therefore, to strengthen the resisting power by combining the advantages to be got from diet and climate, as in the "open air" treatment so much advocated for early stages of phthisis.

The rapid rush for cure in the treatment of tuberculosis is to be deprecated. No new remedy seems at present likely to supplant in any degree the teachings of old experience. Every remedy that was useful before will be useful still, for all that is new is not true and all that is true is not new.

LEPROSY

There are two forms of leprosy—the anæsthetic and the tubercular—the symptoms and course of which are different.

The *anæsthetic* is ushered in by a tired feeling, followed by neuralgic pains in different parts of the body. Subsequently spots, rather difficult at first to detect, appear on the arms and face. As the disease advances they are seen to be symmetrical, brownish-red at the periphery, and in the centre white. They assume in time the size of a filbert or walnut. Anæsthesia is detected over the spots, and also on some fresh parts of the skin, and there may be also swelling of the glands. Contraction then sets in, which as a rule is permanent, and is associated with the distribution of the facial, the ulnar, and the other nerves of the extremities. Paralysis follows, and ultimately topical necrosis of the bone. The course of this form of leprosy is slow, and may extend over a number of years.

The tubercular.—In this form a symmetrical tubercular eruption appears on the face, arms, and legs, and afterwards on the trunk. After a time the tubercles soften, suppurate, and break, and the disintegrating process affects the bones. The course in the tubercular is more rapid than in the anæsthetic, and death occurs in from eight to ten years. In some cases healing of the sores occurs, and brown spots with white cicatrices mark their sites. At times, also, the lungs are affected with phthisis, and the bacillus of Koch, but not the bacillus of leprosy, is recognised.

Bacillus of Leprosy.—Leprosy is caused by a bacillus closely resembling in size and general character the tubercle bacillus.

The bacilli have been found in almost all the organs of the body. They occur in characteristic groups which are either extra-cellular (in the lymph spaces) or inside the cells where they caused marked vacuolisation. Unlike the tubercle bacilli they do not cause caseation or formation of giant cells.

Leprosy was formerly considered a typical example of an hereditary disease. Nowadays it is realised that, at most, a predisposition is inherited. The disease is probably spread by contagion from articles contaminated with the discharges. It has also been directly communicated by inoculation. According to Sticker, in many cases the initial lesion is a tubercle in the nasal mucous membrane.

Treatment.—Up to the beginning of the fifteenth century leprosy was very common all over Europe. It was stamped out by rigidly banning all lepers to the leper-houses, and forbidding intercourse with healthy people. At the present day somewhat similar measures are being adopted wherever leprosy is endemic, as in Norway and South Africa. The lepers are isolated and segregated in special places.

General hygienic treatment with regular baths and careful dressing of the wounds, and active cauterisation of the nodules, improve the general health. Internally increasing doses of chaulmoogra oil are said to do good. Unna recommends ichthyol and strychnine. All discharges must be carefully disinfected.

FRAMBŒSIA (*framboise,* a raspberry)

(*Synonym,* Yaws) is a peculiar disease, which attacks the African race in their own country and in the West Indies, and appears to be a malady epidemic and contagious. After an incubation of from three to ten weeks an eruption is observed on the face, neck, feet, and genital organs, of yellowish or reddish-yellow tubercles, which gradually develop into a moist exuding fungus without constitutional symptoms, or with such only as may result from ulceration and prolonged discharge, viz. debility and prostration. The ordinary duration of the disease is from two to four months, when it ends in recovery, but it may extend to several years, and lead to death by exhaustion. Some consider it similar to *Parangi,* endemic in Ceylon.

Treatment.—Cleanliness, a generous diet, the local use of carbolic acid, and weak citrine ointment form the essentials of treatment; sarsaparilla, iodide of potassium, and bitter tonics may be taken internally.

CONSTITUTIONAL DISEASES

RHEUMATISM

The word "rheumatism" is derived from ῥεῦμα, a fluxion, on the supposition of old writers that it was due to an acrid humour, generated in the brain, and flowing into various parts of the body. This idea has been abandoned; yet the name is retained, and much and varied speculation exists at the present day as to what causes operate in determining the predisposition of the disease to affect the white fibrous tissue which enters into the composition of sheaths, fascia, fibro-serous membranes, and ligaments of joints; and also as to its frequently implicating in the acute form the heart and its coverings.

Etiology and Theory of Rheumatic Fever.—Exposure to cold or wet and sudden chills are the most important factors in causing rheumatic fever. Predisposing causes are a previous attack; personal susceptibility or hereditary predisposition; scarlet fever, during the stage of desquamation; the puerperal state, especially in those who have lost much blood through natural labour or miscarriage; dysentery, after the disappearance of the acute symptoms. The essential cause of rheumatism has given rise to much controversy. There are three chief theories.

(*a*) *The Lactic Acid Theory.*—The opinion has long been held that acute rheumatism is due to some acid poison circulating in the blood. That this acid is lactic acid is supported by the statements of physicians in this country and in Germany, who have testified that lactic acid, when given for another disease—diabetes—has set up painful swellings of joints and symptoms of acute rheumatism. Senator supposes that under the influence of cold the lactic acid, always formed in active muscular exertion, fails to be eliminated by the skin or destroyed by oxidation, and that it accumulates in the system and acts as an irritant to the tissues of joints.

(*b*) *The Nervous Theory.*—According to this view either the nerve-centres are primarily affected by cold, and the local lesions are trophic in character, or the primary nervous disturbance leads to errors in tissue waste, and the accumulation of lactic acid in the system.

(*c*) *Germ Theory.*—This theory, which attributes the disease to a micro-organism, is compatible with some points in its history, and with its successful treatment by a specific remedy. But the investigations hitherto made have not shown the constancy of any micro-organism in the disease.

The germ theory is the most probable one, although we must admit that the specific germ has not been discovered.

Rheumatism is most commonly divided into acute and chronic. The general and local symptoms in ACUTE RHEUMATISM are well marked. The onset is gradual with sore throat, chilliness, want of appetite, feverishness, and aching in muscles and joints. Pain is experienced in one or more joints, and is followed by inability to move, and by swelling and great tenderness. The large joints may be implicated, but the disease usually attacks the middle-sized ones. Hence the knee, ankle, wrist, and elbow are the chief seats. The disease *tends to shift from one joint to another*, and does not often remain fixed in the one first affected.

When the disease is thoroughly established the pain is severe, and is intensified by the slightest movement. The pulse is full and quick, and the fever is attended with a peculiar acrid, copious, and sour-smelling sweat. This sweat, which may almost be regarded as pathognomonic of the disease, seems neither to mitigate the fever nor relieve the pain. The bowels are constipated, and the urine is high-coloured, scanty, and deposits on cooling an abundance of urates.

Unfortunately the disease is not limited to the joints. It has been found that in three cases out of four of acute articular rheumatism with high fever, the heart is affected by endocarditis or endo-pericarditis, and the foundation is laid for permanent chronic valvular disease. The cardiac complication is insidious, and frequently attended with no pain, and may not in its early stage be discovered on examination with the stethoscope; it sets in, as a rule, about the seventh day. While pneumonia is rare, pleurisy with effusion, or bronchitis, may occur.

The temperature ranges from 100° to 104°, gradually ascending for at least a week, and is subject to considerable variations. Sometimes it reaches as high as 108° or 109°, and then death quickly ensues. The amount of urea excreted is very high, reaching in an average acute case to 800 grains daily, nearly double the standard of health.

The duration of the attack varies from three to six weeks. Relapses are common, and although five to six weeks is the usual limit, the attack may extend over some months, as it has no fixed epoch for its departure. The termination is generally in recovery, but often a joint or joints may be left stiff, or may become chronically enlarged. The average number of deaths is usually 1 in 1000. Rheumatism is not thus so serious in itself as in the after-mischief which it entails by cardiac and other complications. In children the disease runs a more subacute course. The joints are less markedly affected. Subcutaneous nodules form in connection with the joints and fibrous tissue as periosteum or tendon sheaths. Chorea may develop. In a large proportion of cases the heart is involved. A variety of subacute rheumatism sometimes met with during an attack of gonorrhœa is termed "gonorrhœal rheumatism." In this form the disease usually locates itself in one of the large joints, as the knee, which becomes the seat of considerable effusion and swelling. This swelling, which is great and rapid, may appear at any period of an attack of gonorrhœa, but as a rule it is most often noted when the discharge is disappearing or has ceased.

In CHRONIC RHEUMATISM there is subacute inflammation of one or more joints, notably, the knee, ankle, and shoulders; and the pain, which is more or less constant at all times, is aggravated by changes of weather, and is accompanied by swelling. The structural changes are those of chronic inflammatory irritation, attended by thickening of the cartilaginous and synovial tissues, which thickening extends subsequently to the capsule of the joint and the neighbouring structures, but shows little tendency to the formation of a liquid exudation, especially of a purulent kind. Sometimes, in consequence of this thickening, and through coalescence of the membranous elements of the articulation with the soft parts lying over them, the joints may become stiff; the cartilages may be frayed out, and ultimately worn away; abnormal adhesions may form, and permanent anchylosis result. Generally speaking, in chronic rheumatism one or more joints are constantly tender and painful and swollen. Stiffness and grating may be detected after a night's repose, and many patients are warned of approaching changes of weather by abnormal sensations in the affected joints; hence the term "prophetic joints." At the same time, it must be remembered that chronic rheumatism is peculiar to the latter half of life; that there is no attendant fever; that it never shifts quickly from joint to joint—never attacks internal organs; and these characteristics, with its tedious course, sufficiently distinguish it from the acute variety, which, however, may supervene at any time on the chronic form. The prognosis is favourable to life, but unfavourable as regards complete recovery.

A form of chronic rheumatism is termed Lumbago. The lumbar muscles are here the seat of pain, which is continuous in character and much increased by exertion. The mere act of straightening the back often causes great agony. When rheumatism attacks the thorax, and the pain is spread over one or more branches of the intercostal nerves, it is termed Pleurodynia.

Formerly considered to be closely allied to gout and rheumatism, arthritis deformans (Rheumatoid arthritis) is now held to be an osteo-arthritis of nervous origin, or depending on chronic microbial infection. It is chiefly a disease of the poorer class, and prolonged exposure to cold and damp is one of the chief causes to which the malady is ascribed. Youth and childhood are exempt from it, and it more commonly exists after the thirtieth year, selecting the joints most continuously and severely overtasked by manual labour. The disease comes on very gradually, the earliest symptom being pain in one or more joints, which pain appears and disappears without any appreciable cause. In the course of weeks or months stiffness is apparent in the joints affected, and the articular ends of the bones become thickened, and grow steadily larger as the disease goes on. With their enlargement the muscles covering the joints waste, and deformity ensues, this deformity in the smaller joints being symmetrical in character. Thus the fingers in the hands are displaced and arranged in a twisted manner over one another towards either the thumb or the little finger, so that the hand frequently becomes like a bird's claw. While the thumbs are usually spared, their homologues, the great toes on the feet, are more frequently and severely attacked

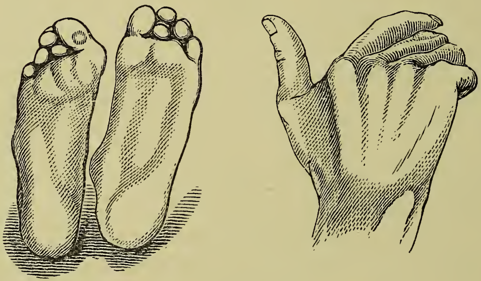

Fig. 7.

than their neighbours. The annexed woodcut fairly represents "arthritis deformans."

The course of the malady, though exceptionally slow, is usually progressive. When once fully developed it is never known to recede, though months and years may elapse before fresh joints are implicated. Roughly speaking, it runs its course without fever or much constitutional disturbance, and treatment exerts little influence on it. All the constituent parts of the articulation—cartilage, bone, and synovial membrane — are implicated in the inflammatory process, although the actual beginning occurs in the cartilages, with overgrowth and subsequent ossification, especially at the free borders. This leads to easily detected nodular masses of bone.

Treatment.—The varying course and duration of this disease for a long time clouded the actual value of medicinal agents, and hence a shifting therapeutics has characterised the treatment of ACUTE RHEUMATISM. Without entering into details we may say that its treatment has exhibited five distinct epochs—(1) the antiphlogistic, (2) the alkaline, (3) the blistering, (4) the expectant, and (5) the salicylate. Each of these modes has had its advocates, but we may now confidently state that statistics show the superiority of the salicylate to the other means of treatment, first, in diminishing the pain; second, in lowering the temperature; third, in hastening convalescence.

By the salicylate treatment is meant the administration of salicin or the salicylate of sodium, of which the latter is usually preferred because of its readier solubility and quicker absorption.

1. Choosing, therefore, the salicylate of sodium as the remedy to be administered, we should give it dissolved in water in 20-grain doses every two hours. Unless cardiac complications exist, this will be followed by lowering of the temperature and abatement of the pain in forty-eight hours.

2. After forty-eight hours the salt should be given in the same doses every four hours for two days and then every six hours for three days. At the expiry of five days it should be continued in 10-grain doses thrice daily, for at

least seven days. A mixture of iron and quinine should afterwards be ordered to assist convalescence.

3. Heart complications begin on the sixth or seventh day. If the salicylate treatment is adopted from the beginning of the attack, in all probability there will be no cardiac complication. If, however, this treatment be commenced on the fifth or sixth day, and if the heart affection is subsequently recognised, the question occurs, Should the salicylate treatment be continued? Difference of opinion exists as to this, but we agree with those who state that, if pain and fever still exist, the treatment should be persisted in.

4. See that the salicylate is properly eliminated by the system. This is readily done by testing the patient's urine with the tincture of the perchloride of iron, which gives to it a purple colour.

5. If salicin should be preferred, the dose required at the same intervals and for the same length of time is twenty-five instead of twenty grains.

6. If this mode of treatment be adopted there is little chance of any relapse, and progressive recovery may be confidently expected.

7. Should a high temperature, 108° or 109° F., set in at any time it indicates cerebral complications, and the only hope of averting a fatal issue is by at once placing the patient in a cold bath as mentioned under typhoid fever (p. 49). By this means and by the application afterwards of ice to the shaven scalp it is possible to lower the hyperpyrexia.

8. The internal treatment may be supplemented by the application of liniment of opium, belladonna, and chloroform to the affected joints. The affected joints may be sprinkled with methyl salicylate and then wrapped up in cotton wool. A one per cent watery solution of carbolic acid has been recommended, or painting the joints with the same acid and linseed oil in the proportion of 1 to 15. The patient should always lie between blankets. The perspiration is thus absorbed, and there is greater comfort and less risk of catching cold.

Diet.—All nitrogenous food during the acute stage does harm, and the diet should mainly consist of milk supplemented at stated intervals by chicken soup. Lemon juice may be given as a drink in the quantity of two or three ounces daily. Action of the bowels should be solicited daily by a mild saline aperient given in the morning, as citrate of magnesium. Convalescence should be aided by fish and white meat, as boiled chicken or roast mutton with three or four ounces of claret daily. Eggs should be avoided.

While we consider the salicylate treatment of rheumatism undoubtedly superior to the alkaline, we still deem it advisable in a few words to describe the latter method. It is affirmed by those who employ it that the heart is only implicated during the first week of the disease when the fever is high and the urine acid, and that it is not attacked when the urine is alkaline. Therefore to render the urine alkaline two scruples of the bicarbonate of potassium should be given every three or four hours in half a bottle of soda water, or in an effervescing draught of citrate of ammonium, and continued steadily until its object is attained. If the patient be robust and if the urine be loaded with lithates, 10 minims of colchicum wine should be added to each draught.

Alkaline lotions are also applied to the joints. Half an ounce of carbonate of sodium and six drachms of liquid extract of opium are put into nine ounces of hot water. Flannels are soaked in this and applied to the painful joints and covered with gutta-percha tissue.

In CHRONIC RHEUMATISM the treatment is essentially tonic, and if possible a residence should be selected in a dry warm climate. In many cases the salicylate of sodium in 20-grain doses thrice daily has an excellent effect. If no good be effected by its use in three or four days it should be discontinued and other remedies must be employed, as iodide of potassium (F. 5), combined with the external application of turpentine, or, if the pain be severe, with hypodermic injections of morphine. In very chronic forms accompanied by great debility mistura guaiaci has long had a deserved reputation, or pulv. guaiaci with iodide of potassium and tinct. colchici (F. 6*a*), or a mixture of iodide of sodium, salicylate of sodium, and phenazonum (F. 5*a*). If circumstances permit, and if there should be effusion, concentrated brine springs, rich in solid matter, are useful, as Aix-la-Chapelle, Aix-les-

Bains, Wiesbaden, Woodhall, and Droitwich; while, if the pain is great, the more indifferent waters containing less saline matter are efficacious, as Wildbad, Bath, Buxton.

In lumbago and pleurodynia warm fomentations give relief, after the seat of pain has been rubbed with a chloroform and belladonna liniment (F. 57*h*). If the urine is scanty and acid, give full doses of citrate of potassium at short intervals.

GOUT

Sydenham, the father of English medicine, who was a martyr to gout, thus congratulates himself on the fact:—

"So have lived, and so have died, great kings, and leaders of armies and fleets, philosophers, and men of varied culture, of this peculiar disease. It kills more rich men than poor, more wise than simple."

Gout was formerly considered to be a catarrh, and derived its name from the French *goutte*, Latin *gutta*, a drop, because it was supposed to be produced by a liquid which was distilled drop by drop into the diseased part. It is now deemed a specific inflammation, attacking by preference those who live well, and especially those who are predisposed to it. It is not unknown in London hospitals, as boatmen, butchers, and footmen are admitted with it. In Scotch infirmaries it is never seen.

Males are more frequently attacked than females. It is hereditary, and the result of high living and eating too much, especially when the mode of life is sedentary. It is specially induced by port wine, strong ale and porter, and rich food; and is rarely due to drinking gin or whisky.

Its special seat is the great toe, but it has also been observed in the heel, the calf of the leg, the ankle, knee, wrist, thumb, and fingers.

Symptoms.—An attack of gout is said to come on most frequently towards the close of January or beginning of February. For some days the patient feels ill and out of sorts, with faulty and imperfect digestion, flatulency, and heaviness. The temper is peevish and irritable, and little things annoy. With or without these preliminary symptoms the patient may go to bed at the usual hour, and awake to find himself suffering from the most severe and excruciating pain in the ball of the big toe, which is said to be similar "to dogs gnawing at a bone from which they have already eaten all that could be got." Even the weight of the bed-clothes is oppressive, and no change of posture gives relief. After some hours the pain may abate, and the patient falls asleep; but on awakening he finds the joint inflamed and swollen. There are also fever and furred tongue, with greater irritability and depression. The urine is high-coloured, acid, of high specific gravity, deficient in quantity, and what is passed deposits, on cooling, urates and uric acid.

The pain continues, with paroxysms of acuteness, for about a week in a first and an acute seizure; in other cases, and when the attack is not primary, it may last as many months.

After the paroxysms have subsided the urine is usually copious, with increase of uric acid, which, with phosphoric acid, is at first insufficiently eliminated.

A violent itching of the toe sometimes precedes the outburst of gout; or it may attack the toe when the gout is disappearing, this being followed by decrease of the swelling and desquamation of the cuticle.

Gout at times attacks internal organs, and then it is best termed Retrocedent Gout. A French author says—"Articular gout is a disease, internal gout is death." It may thus retrocede to the stomach, giving rise to vomiting, internal pain, spasm; or to the heart, leading to disturbed action, small feeble pulse, or syncope; or to the brain, causing severe headache, sluggishness, apoplexy, or paralysis; or to the lungs, originating a form of asthma, with severe cough.

Sir W. T. Gairdner has alluded to what is termed a "gouty diathesis." By this is meant a habit of body, in which, without gout showing itself externally, flying pains are prevalent over the body, which are sometimes considered neuralgic, and treated accordingly; whereas they are of a gouty nature, and are not benefited by the usual antineuralgic remedies.

The *chemistry* and *pathology* of gout centre round the properties of uric acid and the urates. Gouty concretions are composed of sodium biurate, and the blood and morbid effusions of gouty persons are abnormally impregnated with uric acid. According to Sir W. Roberts, in the normal state the uric acid which circulates in the blood is in the form of quadrurate. It is removed unchanged by the kidney, and with such speed and completeness as to prevent any undue detention or any accumulation of it in the blood. But in the gouty state the quadrurate lingers unduly in the blood and accumulates therein. The detained quadrurate, circulating in a medium which is rich in sodium carbonate, gradually takes up an additional atom of a base, and is thereby transformed into sodium biurate. This transformation alters the physiological problem. The uric acid, or rather a portion of it, circulates no longer as the highly soluble and easily secreted quadrurate, but as a biurate which is almost insoluble in the blood serum, and is, moreover, probably for that reason, difficult of removal by the kidneys. Under these new conditions, sodium biurate accumulates more and more in the blood, and when the accumulation has reached a certain point, is precipitated in the crystalline form in the joints and elsewhere, thereby determining the occurrence of a "fit of the gout." When the attack is over, some years may elapse before a second occurs, but on account of errors of diet and failure of the kidneys to eliminate the *materies morbi* other seizures occur. The intervals between the attacks are shorter and shorter, and the patient becomes a martyr to gout, which is not now confined to one joint, but invades fingers and feet, external ear, eyelids, and nose. So chronic gout, with interludes of sharp attacks, is the condition established. Deposits of the biurate of sodium of a chalky consistence called "tophi" are formed round joints, and occasionally the joints are distorted, and sometimes ulceration occurs with discharge of the concretions. The same salt also invades the kidneys, being deposited first within the tubules and subsequently in the intertubular tissue, which leads to induration and contraction, and constitutes the gouty or cirrhotic kidney. If this contracted kidney follows upon gout, a section of it shows fine white streaks running in the course of the straight tubes in the pyramids, and these white streaks have been shown to consist of prismatic crystals of the biurate of sodium. The cirrhotic kidney dependent upon other factors than gout does not show this deposit.

Sir A. Garrod has pointed out a curious connection between gout and chronic lead poisoning, and has stated that in his hospital about 30 per cent of the gouty patients from their occupations had been subject to the influence of lead. Their habits had not been intemperate, and the supposition is that persons who are already gouty are more susceptible than others to be injuriously affected by lead. This supposition is strengthened by the fact that persons of a gouty habit or who have already had a severe attack of gout are liable from medicinal doses of the acetate of lead to have in a short time colic or a blue line upon the gums.

Diagnosis.—Gout is allied in some measure to rheumatism in its symptoms and pathology, yet differs materially from it. Gout attacks either one joint or the small joints, and usually occurs after thirty as the result of hereditary taint or high living. It is associated at first with a vivid redness, and afterwards with the formation of chalk stones; while rheumatism invades the larger joints, produces fluctuation there, occurs at any age, and is accompanied by fever and a peculiar sour-smelling sweat. In gout, before and during the fit, the urates are deficient, though they may become excessive afterwards; while in rheumatism the urates are always abundant. Finally, rheumatism is a disease of the poor, gout of the rich, or of those who are able to afford the luxuries of the wealthy.

Treatment.—Proper diet is an essential factor in the prophylaxis of gout. All articles of food which tend to produce the *materies morbi*—uric acid—should be forbidden. The food should consist mainly of lean meat, fish, soup, green vegetables, a small amount of milk, bread, and eggs; and no more should be taken than what will satisfy hunger at any meal. Fruit in small quantities is permissible. Exercise, as by gymnastics or walking, is essential to promote tissue metamorphosis, and for the same reason muriated saline or alkaline waters are beneficial. Hence the well-deserved reputation of Homburg and Kissingen, Carlsbad and Vichy. The salts of lithium also specially promote the elimination of uric acid, and hence the natural waters of the Crown Spring in Obersalzbrunn and Salzschlirf are recommended, or an effervescing mixture twice or thrice daily containing two or three grains of carbonate of lithium. But undoubtedly the best solvent of uric acid and insoluble urates is the organic base—Piperazine. It fulfils the three requirements: (1) The base only forms an easily soluble neutral salt even in presence of excess of uric acid. (2) It is not oxidised in the organism like most organic bases, but passes through undecomposed and with its solvent powers unaltered. (3) It creates no disturbances in the organism. Piperazine should be administered 15 grains daily in much water, preferably in an effervescent water.

When an acute attack comes on, the indications of treatment are *local* and *general.* The part affected should be wrapped in flannel, cotton-wool, or oil-silk, or gutta-percha sheeting. Some prefer to apply a poultice sprinkled with tincture of opium or belladonna, and after slight friction to bandage when the inflammation has subsided. Dangerous results have followed the use of leeches or cold applications. After the bowels have been freely opened by calomel and jalap, or by Sir Charles Scudamore's draught, which contains colchicum, carb. magnesia, and sulphate of magnesium (F. 68), colchicum should be administered as follows:—

1*st,* Give it in the form of the tincture or wine in 30-minim doses with carbonate of magnesium. The quantity taken of the wine or tincture should never exceed 120 minims in the twenty-four hours.

2*nd,* Suspend the medicine immediately if it causes more than four stools in the day.

3*rd,* Remember that while it averts a paroxysm, it also seems in time to lose its influence to do this; so that a patient who trusts to it and neglects proper diet, will ultimately pay dearly for his temporary immunity by a terribly severe and uncontrollable attack of the disease.

Antispasmodics, as ether or camphor, with sinapisms and friction, are beneficial in irregular or retrocedent gout; and if the stomach or heart is affected, alcoholic stimulants must be given. In *chronic gout* small doses of the tincture or wine of colchicum often afford great relief. Guaiacum, iodide of potassium, and the preparations of cinchona are in certain cases also useful. A pill of extract of colchicum, digitalis, and colocynth is effective in gouty cases with feeble heart, and especially if diuresis is required (F. 5*b*). If circumstances permit and the journey can be easily undertaken, the waters of Wiesbaden, Teplitz, Carlsbad, and Homburg are markedly efficacious; and in our own country Bath and Buxton can be recommended for their baths.

DIABETES

The word "diabetes," derived from the two Greek words, *διὰ βαίνω*, literally means that the water is constantly running through the patient's system. Used in this sense, diabetes may have a wide significance, but it is now employed as representing two distinct kinds of disease. In both there is an increased flow of urine; but in the one, Diabetes Mellitus, there is glucose—commonly termed sugar—in the urine; in the other, Diabetes Insipidus, this is absent.

Diabetes Insipidus (*Synonyms*, Diuresis, Polyuria) seems to depend on unknown causes, attacking by preference the male sex, usually between the ages of five and thirty. It has certain permanent and characteristic features, viz. an excessive flow of uncoloured urine of low sp. gr., containing neither sugar nor albumen, and attended with a dry skin and great thirst. The course of the disease is uncertain; usually it is slow, and other affections supervening may cut off the patient. As in Diabetes Mellitus, death is ushered in sometimes with diabetic coma. The only remedies which seem rationally to do good are the ext. ergotæ liq., or preparations of opium in large doses. Other modes of treatment which have been tried are empirical, as alum, gallic acid, jaborandi, atropine, and valerian.

Diabetes Mellitus (*Synonym*, Persistent Glycosuria), although it seems to have been known in some measure to the ancient physicians, was practically unrecognised until Dr. Willis, in 1674, described it as a distinct disease; "for in it the urine differed from all other fluids of the body, as if it had been mixed with honey or sugar, and having a powerfully sweet taste." Passing over subsequent years, it may be mentioned that Dr. M'Gregor of Glasgow in 1837 discovered sugar in the blood as well as in the urine, "and that the stomach formed saccharine matter instead of healthy chyle, which entered into the blood, and instead of forming fat, bone, and muscle, was passed into the system as sugar, and thence eliminated by the kidney." Claude Bernard in 1848 opened up a new era in diabetes when he pointed out how sugar was formed and excreted from the system. He found the blood of the hepatic vein to be rich in sugar, whilst the blood of the portal vein contained no sugar whatever, or mere traces of it; and he further discovered sugar in the livers of animals fed entirely on meat. He concluded, therefore, that as the blood entering the liver contained no sugar, while that leaving it had it in abundance, sugar was formed in the liver under normal conditions. He subsequently discovered within the liver itself a substance closely resembling sugar in the arrangement of its elements, and readily changed into sugar under the influence of an animal ferment. This substance was GLYCOGEN, and around it he perceived the formation of sugar in the liver centred. For the transformation of glycogen into sugar was due to the action of the liver cells, and the hepatic veins carried the sugar-holding blood to the general circulation to be oxidised in the lungs and muscular tissues of the body. If, owing to a fault of the liver, the conversion of glycogen into sugar was abnormally in excess, then the sugar accumulated in the blood, and was eliminated by the urine. A modification of this theory is that there is a diminished destruction of sugar (even when normally formed) in the system, but this leads to another question, not yet fully elucidated, which will presently be referred to. Further, he showed that by puncturing or irritating the eighth pair of nerves at their origin in the fourth ventricle, an abnormal development of sugar could be produced.

Pavy disputed these views, and contends that sugar in small quantity is normally found in the blood, and is being constantly used up in the liver, the excess of sugar in diabetes being due to failure in assimilative power on the part of the liver. But his contention is no longer tenable. Bernard's views are now generally accepted, and account for the form of diabetes associated with disturbances of the liver in which a greater quantity of sugar is permitted to pass into the blood than can be consumed in the normal processes of nutrition. This is termed Hepatic or Hepatogenous diabetes, and corresponds with the slight or moderately severe forms of the disease.

A grave form of diabetes has come recently to be recognised in which the glycogenic function is not supposed to be at fault, but in which another organ—the Pancreas—is implicated. Morbid changes are found in the pancreas in 50 per cent of diabetic patients after death. Numerous experiments on dogs have shown that the total extirpation of the pancreas is followed by glycosuria. From these facts some observers have explained the connection which exists between the pancreas and diabetes. They state that the pancreas has a double secretion—an external which is poured into the intestines, and an internal which passes into the blood. This latter is of the nature of a *glycolytic* ferment which materially determines the destruction of sugar in the circulation. Atrophy of the pancreas by arresting this ferment would necessarily lead to sugar appearing in the urine.

The loss also of the external secretion would prevent the emulsionising of fatty matters in the food and consequently cause the emaciation of the body which markedly accompanies the disease. Other observers, while admitting the connection between disease of the pancreas and diabetes, contend that the pancreas fulfils a specific action in the elimination and destruction of sugar, the nature of which is not yet determined. Cases of diabetes have thus been divided into two great classes, of which the first is due to excessive sugar-formation—Hepatogenous; and the second to diminished saccharine consumption or malassimilation—Pancreatic. With the former the amount of urine passed and the quantity of sugar contained in it are not extreme and the emaciation is not great. With the latter the quantity of sugar is always great and the emaciation is very apparent. It must also be remembered that sugar may *temporarily* be detected in the urine of certain persons who eat saccharine substances in large quantities, and that it may also be found in certain other conditions, as in cerebral injuries, meningitis, tumours of the brain, some affections of the liver, after the inhalation of chloroform, or poisoning by perchloride of mercury.

Morbid Anatomy.—The nervous system shows no constant lesions and the heart no characteristic changes. The lungs commonly show tuberculosis or acute broncho-pneumonia or croupous pneumonia. The liver is usually enlarged and the kidneys are sometimes fatty. The most important changes are observed in the pancreas. Saundby states that in seven out of fifteen cases it was atrophied, abnormally firm and fibroid in four, and normal only in four.

Symptoms.—Diabetes may be suspected if there is thirst and hunger and an increased quantity of urine, with loss of weight, impaired physical and mental endurance, and disinclination for all sexual intercourse. The skin is dry, the tongue is hard, red, and cracked, the digestion is faulty, and the bowels constipated. Wandering and severe pains are frequently complained of in the muscles of the calf of the leg, and there may be loss of knee-jerk, and a loss of power in the extensors of the feet (*Diabetes Tabes*). The temperature is low, there is a lack of interest in passing events, and a melancholy hopelessness as to the future.

The urine passed may rise to 15, 20, 30 pints, or more, in the course of twenty-four hours, and it presents to the eye a pale colour, while its odour is sweet, like that of new-mown hay or that detected in a chamber containing apples. There is no sediment after standing, and this and the clear colour suggested to Dr. Prout the pertinent inquiry for fixing the date of the beginning of the disease by asking the diabetic patient, "When did you last observe your urine muddy?" The effect of sugar is to increase the specific gravity, which in all cases of persistent glycosuria is above 1020, and in some instances rises to 1050. TESTS FOR GLUCOSE (SUGAR); *see under* DISEASES OF THE KIDNEY.

The COURSE of diabetes is chronic. It is free from fever and the morbid process may come to a standstill. The prognosis is more grave in young subjects than in those above thirty, and statistics show that though its duration may extend over several years, yet three-fourths die in from six months to three years after its first detection; and how? By exhaustion, by œdema of extremities, phthisis, pneumonia, bronchitis, carbuncles, abscess, gangrene, or through inflammation of serous membranes of an asthenic type, or more commonly death takes place in a few days with coma. This coma is not uræmic, for there is an uninterrupted flow of urine to the last, with no marked twitching of the muscles, and the temperature is much lower than normal. The blood in a certain number of cases of diabetic coma presents a peculiar pink or strawberry colour, and on being placed aside a creamy layer collects on the surface, which is seen to contain a considerable quantity of fat; there is indeed a condition of *lipœmia.* This condition was observed in a diabetic patient at the Western Infirmary of Glasgow. The comatose condition was at one time supposed to be due to acetone, hence the term *acetonœmia* applied to it. Later researches have, however, shown that the blood-poisoning is not due to acetone alone, but that the toxic agent is a compound intermediate between sugar and acetone. Most likely β-oxybutyric acid.

Cataract, which is associated with advanced cases of diabetes, comes on suddenly, and out of two hundred and twenty-five collected cases was detected twenty times. It attacks both eyes, and seems due to the direct action of the sugar influencing the nutrition of the crystalline lens. Other ocular affections, as paresis of accommodation, amblyopia, hemiopia, retinitis, and optic-nerve atrophy, are common sequelæ from this disease. Eczema of the vulva is always a suspicious symptom, and, in fact, it may be the only complaint which a patient makes. Its existence always demands an examination of the urine.

Prognosis.—The quantitative estimation of the sugar in the urine is of importance with regard to prognosis and treatment. If, notwithstanding the strictest dietary, the patient's urine contains from 10 to 20 grains of sugar per ounce, the case is GRAVE and will steadily pursue a downward course. If, however, by a strict and careful dietary, the amount of sugar becomes reduced to 3 or 4 grains in the ounce, the patient may live for a considerable period. If on the adoption of the diabetic dietary the sugar quickly disappears from the urine, then the disease is slight and not dangerous to life.

Treatment.—The chief aim in treatment has always been to so arrange the diet that it contains as little sugar-forming material as possible. Most attention has always been paid to the carbohydrates. Formerly we aimed at entirely excluding carbohydrates from the diet-sheet. Nowadays we allow the patient as much as he can assimilate. The diet for each patient must be a matter for individual consideration, though certain general principles may be laid down. On first coming under treatment the patient is allowed to partake of ordinary mixed diet. On testing his urine we thus find out the maximum excretion of sugar. We then place the patient on a rigid anti-diabetic diet, and test his urine to find out the maximum benefit obtainable by diet. By now gradually adding small quantities of carbohydrates to the diet we find out how much the patient can stand without having the sugar in his urine materially increased. In all cases we must try to vary the diet as much as possible. The patient may partake freely of meat, fish, eggs, poultry, game, fat, butter, cheese, tea, coffee, and a moderate amount of milk. Vegetables are injurious, but all vegetables are not equally so, for experience has shown that green vegetables can be taken without injury. A general rule with regard to vegetables may be thus expressed. ALL GREEN VEGETABLES OR GREEN PARTS OF VEGETABLES MAY BE EATEN, FOR WHEN CHLOROPHYLL OR GREEN-COLOURING MATTER IS ABUNDANT, THEN SUGAR AND STARCH ARE SCANTY. Thus spinach, the green parts of celery and asparagus, Scotch kale, cabbage, watercress, lettuce, and all kinds of green salad may be taken. Cauliflower is doubtful. French beans may be used entire when young; or, when older, by removing the beans. Haricot beans, peas, all cereals, potatoes, carrots, turnips, parsnips, and beetroot, are forbidden. Sugar will produce sugar, but substances sweet in themselves and nearly allied to sugar fail to increase saccharine urine. There is a craving for sweets, and we find that animal fats and glycerin satisfy this to a great extent. All sweet wines should be stopped, but whisky and cognac may be permitted, with light wines and light beer in moderate amounts. To take the place of the carbohydrates various diabetic articles of diet are on the market, as bread made from gluten, nuts, almonds, cocoanuts, etc. In addition to being expensive, it is found that many of these preparations contain almost as much starch as ordinary bread. They should thus always be tested before being recommended. "Torrified bread" is acceptable to many diabetics. It is prepared by toasting thin slices of bread until they are thoroughly browned, almost blackened. The starch and gluten are thus in great part destroyed. To replace the sugar, saccharin, lævulose, or glycerin may be used. The patient should take a moderate amount of exercise daily.

In diabetes many medicinal agents have been tried, as arsenic, potassium bromide, sodium salicylate, jambul, antipyrin, sulphonal, phenacetin, uranium nitrate, but the only drug that has gained general approval in the treatment of diabetes is opium. Its alkaloids morphine and codeine have each their advocates, but codeine is usually preferred, as it is less constipating than morphine and disturbs digestion less. It should be given in $\frac{1}{2}$-grain dose thrice daily, and this dose may be gradually increased to 3 or 4 grains (F. 72). In the graver forms of diabetes, codeine certainly has the power with a careful diet of holding the disease in check, and for the graver forms its use should be reserved. The treatment by pancreatic extracts at present on trial is suggestive, but as yet no striking results have followed. Without entering into details I may state that in *ordinary* cases a careful dietary may be supplemented by the following treatment.

1. $\frac{1}{20}$ of a grain of nitrate of pilocarpine is placed on the tongue thrice daily. This relieves thirst, and causes what a Scotch diabetic terms "sappiness" of the mouth.

2. Pure water or weak alkaline water is permitted before a meal, or it may be taken half an hour after a meal.

3. If there is not a natural action of the bowels, an enema is always insisted on.

4. If the patient can afford it, a yearly visit should be paid to Carlsbad or Vichy, or Neuenahr or Vals, for it is found that patients using these waters void little sugar, and can take vegetable diet with comparative immunity.

RICKETS

Rickets is a disorder of nutrition peculiar to childhood. This disordered nutrition leads to overgrowth, with deficient calcification of the tissues destined to form bone, and hence the growth of the skeleton is interfered with, and transient or permanent deformity occasioned of some of its constituent parts.

The etiology of rickets has excited much controversy, and evoked many theories. It is acknowledged to be a disease of the poor more than the rich, and especially the poor of large towns, whose homes are sunless and badly ventilated. The period for its first appearance in the majority of cases, as shown by statistics, is during the first dentition from the sixth to the thirtieth months. It seems to affect the sexes equally, and in some cases is inherited, especially from the mother. Improper feeding, authorities unanimously state, is the chief factor in causing the disease. According to Cheadle, the diet is most frequently deficient in fat and albumen. Thus over-lactation may lead to poorness of the milk, which becomes incapable of properly nourishing the child. On the other hand, early weaning is a frequent etiological factor. The child is then put upon patent food stuffs, which cause gastric disturbance and indigestion. To remedy this the food is diluted. Such diluted food, though the child may be able to digest it perfectly, may be incapable of properly nourishing the child. Among the poor to save trouble it is customary to allow even very young children to partake of everything that is on the table. The child's digestion is thus ruined, and as a result rickets appears.

According to Wagner, improper feeding causes dyspepsia and excess of lactic acid, which leads to irritation of the bone-forming tissues. At the same time, the earthy matter is reduced either directly, as in cases of prolonged suckling, or indirectly, as when diarrhœa carries off the lime salts from the intestines before they are absorbed. The combination of these two factors causes rickets, and the child becomes irritable and restless and sleeps badly. Histologically rickets consists of excessive calcification and deficient ossification at the growing ends of the bones. "The preparatory stages of ossification are exaggerated; the completion of the process is delayed." The bones become swollen at the epiphyses, and are weak and apt to bend. Three characteristic symptoms develop in most cases. 1st, A diffuse soreness of the body, so that the child cries when an attempt is made to move it, and prefers to lie perfectly still. 2nd, There is always more or less fever at night and a tendency to throw off the bedclothes. This may be partly due to the fact, that the general sensitiveness is such, that even their weight may be distressing. 3rd, There is such profuse sweating, particularly about the head and neck, that in the morning the pillow is often found soaked with perspiration.

These symptoms may have been noted some time before the peculiar changes in the bones commence. The articular ends of the long bones swell and protrude under the soft parts, more particularly at the wrists, ankles, elbows, and knees. In the skull, the disease shows itself by non-closing of the fontanelles and sutures. If the child is young, the teeth do not come forward—if older, they may rot and drop out. Through the force applied to the bones by the muscles attached to them, and by the weight of the body, they become further deformed and bent, usually in an outward curve. The rachitic rosary is due to the swelling of the ossifying centre at the junction of the cartilages and the ribs. The ribs also are depressed laterally, and cause the breast-bone to stick out like the keel of a boat. There is also often spinal curvature. Naturally the increase of the body is delayed. The child cannot walk; or if it could walk before, it now loses the power to do so. In mild cases the disease does not advance far. The morbid process is checked, and recovery results with, however, more or less striking deformity. In severe cases the diarrhœa increases, the weakness is extreme, and the child dies with the symptoms of marasmus and hectic fever. The younger the child the greater the danger. The deformities of the skeleton may entirely disappear, and of those that remain two only may be troublesome in after-life—the pigeon breast in both sexes, and the distorted pelvis in the female.

Treatment.—Hygienic rules must be carefully enforced. The earliest possible symptom of rickets should be watched, and if detected the extension of the disease may be prevented. The mother's milk must be carefully attended to. As a rule, this is sufficient until the sixth or seventh month without any auxiliary aid, but after that time it should be supplemented by the use of cow's milk, sweetened and diluted according to the age of the child. Next to cow's milk are Nestlé's food and Revalenta Arabica, the main constituent of which is finely powdered lentil meal. The child should not be suckled after it is ten months old. At nights it should have a tepid bath in which there is some of Tidman's sea-salt. Sea air in summer is very essential, and effects in many cases marked improvement. During the day the child should be carefully protected from the cold and be much in the open air. Special care should be taken to prevent deformity. The child should not be allowed to walk, and for this purpose splints applied so as to extend beyond the feet are very effective. Of medicinal agents phosphorus is undoubtedly the best remedy. It is "the iron of rickety children." It relieves the tenderness, diminishes the perspiration, and gives the child comforting sleep. An improvement from its use may be observed in a fortnight; after three or four weeks the child attempts to sit up, or if an older child, to walk; in about two months the teeth begin to show. $\frac{1}{120}$ part of a grain of phosphorus may be given two or three times a day. The phosphorus should be dissolved in alcohol by the aid of heat (F. 91*c*). If the digestion be fairly good, cod-liver oil should be given twice daily in increasing doses during the winter, spring, and autumn months, and Whitla recommends a combination of the oil of phosphorus (B.P.) and cod-liver oil (F. 91*c*).

CANCER

Cancer is a malignant growth which may attack any part of the body. It consists of cells and a connective tissue stroma; the former subsist in a varying manner, much depending on the situation of the growth. They are always derived from epithelial cells; it is in fact an excessive and abnormal multiplication of the epithelium of a part which constitutes the local disease. Thus, in the female breast the epithelial cells forming the normal gland acini divide and multiply, and without following a definite arrangement, ultimately penetrate the connective tissue and move along the lymphatics. The tumour is not encapsulated, and hence the name—*crab-like.*

Although cancer begins as a local affection, it sooner or later invades other tissues and organs, both near and distant. A striking peculiarity of the tumour tissue is, that it preserves the same characters as to size and arrangement of its cells in whatever organ it invades. Just as the primary tumour is composed of cells identical in feature with those of the tissue from which it grows, so the cells composing the secondary tumours are reproductions of those forming the primary tumour. They are carried by the lymphatics to their destination, and there grow and reproduce themselves. The lymphatic glands on the route are indurated and swollen. When the stroma of the tumour is abundant, the cancer is called a *scirrhus* or hard cancer; when very scanty it is called *encephaloid* or soft cancer. Intermediate varieties exist.

Of late years much research has been devoted to explain the causation of cancer. Many are now persuaded that cancer is a specific disease due to special micro-organisms. These organisms are supposed to be of the nature of protozoa, and they are found as small, round, nucleated bodies in the cancer cells. The researches of Ruffer and others show that these bodies originate in the nucleus, and they allege that by a spore-formation they enter the protoplasm of the cell and develop, occasionally nearly filling the body of the cells. Although it is undoubted that such bodies are to be found in cancerous tumours, the view that they are living protozoa, engendering cancer, is not universally accepted by pathologists.

Treatment.—The treatment of cancer is considered when speaking of the different organs of the body it attacks, as the liver, peritoneum, etc.

DISEASES OF RESPIRATORY ORGANS

Accurately and intelligently to understand these, it is necessary to be familiar with the meaning and importance of certain terms which are met with in the description of diseases of the chest. The air during breathing passes into the trachea, the wall of which is comparatively rough in three-fourths of its circumference, with strongly-marked cartilaginous rings, and the current of air entering is great and quick. Below the bifurcation of the trachea the bronchi divide into smaller and smaller tubes; the cartilaginous rings become less and less distinct, until, in the terminal ramifications of the bronchi, they cease to exist, and the tubes are smooth on their internal surface.

If the stethoscope is placed over the trachea, two rough harsh sounds of equal length will be heard, the one accompanying inspiration, the other expiration, with a distinct interval between them. This is what is termed "tracheal or cavernous respiration."

Next, on placing the stethoscope on the upper bone of the sternum, opposite the point at which the trachea divides into the bronchi, we hear a modification of the tracheal breathing, the character of the sound being hollow, blowing, and soft, and with the inspiration rather longer than the expiration, and they are still separated by a slight but appreciable interval. This is "bronchial respiration" or "tubular breathing."

Again, on listening over other parts of the chest, it will be found that the blowing character is gone, that the inspiration is soft and gentle, that the expiration immediately follows it, and is less prolonged. The combination of the two constitutes the healthy vesicular murmur.

If the person is told to speak when the stethoscope is at the different situations mentioned, it will be found that the character of the voice also varies. Thus, over the trachea it seems as if he were speaking right into the ear, so loud and full is the sound; even a whisper can be heard. This is "pectoriloquy."

Over the sternum it is still distinct and clear, but not so loud. This is "bronchophony."

Over other parts of the chest, on the other hand, a buzzing scarcely audible sound is detected.

These sounds, as will be seen, are significant of various diseases when heard in parts of the chest where in health they are not detected.

The mucous membrane lining the respiratory tract is in health moist, but not too much so, else this also would give rise to disease. As illustrating terms used, and various conditions, let us suppose a common cold is caught. The effect of this on the mucous membrane of the respiratory tract, if it extends to it, is, first, to make it dry; secondly, swollen and inflamed. The consequence is an alteration in the character of the sounds where the vesicular murmur is heard. If the larger air-tubes are alone involved, a deep-toned note will be produced like that of a person snoring in sleep, or a humming like that of a spinning-top; hence it is often described under the terms cooing, snoring, buzzing, or, technically, "sonorous rhonchi." If the dryness extend to the smaller air-tubes, the sounds are shriller in character — piping, whistling, hissing, or, technically, "sibilant rhonchi," sometimes termed "dry râles." These sounds may occur separately or together, and, if together, there is frequently a combination of the characters of both heard on auscultation, giving rise to a strange medley of cooing, whistling, piping, and snoring.

The mucous membrane in a cold, although still inflamed, does not remain dry, but becomes moist, and hence the dry sounds are replaced by moist ones. The air passes through liquids, and, in doing so, gives rise to bubbles, and these liquid sounds are termed "moist râles." If these are fine, and confined to the smaller air-tubes, the term "small crepitation" is used; if on a larger and coarser scale, involving the larger air-tubes, they give rise to "large crepitation." These two liquid sounds may and often do merge insensibly into one another, so that they are often heard in the same chest during the same complaint.

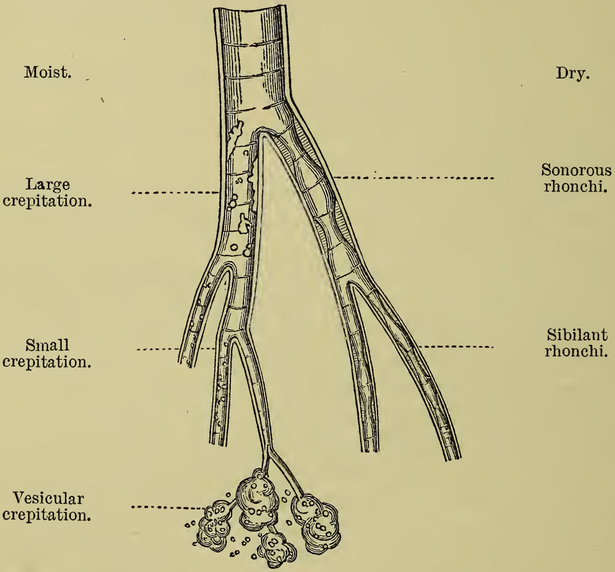

Fig. 8.

It will thus be observed, as the woodcut (Fig. 8) shows, that we have "sonorous rhonchi" and "large crepitation" as representing the dry and the moist sounds of the larger air-passages; "sibilant rhonchi" and "small crepitation," in a similar manner, being applied to the sounds in the smaller air-passages.

Leaving the mucous membrane as seen in its inflammation from a common cold, we may say further that moist sounds are produced by bubbles of air traversing or bursting in a somewhat viscous flood. Hence they may be formed, not merely in the bronchi, but in the terminal air-vesicles, or on a larger scale in cavities or ulcers of various sizes. They may thus be fine, scarcely audible, or coarse, resembling gurgling and splashing, and between these two extremes there are various gradations. A sub-crepitant or muco-crepitant râle is produced in the minute bronchioles and alveoli by the penetration of air through a thin liquid. It is a sharp, well-defined sound. Between this and the true dry crepitation there are many intermediate sounds which may be described according to their size as fine or coarse. *Dry crackle* is significant of three or four distinct small dry crackles heard during inspiration, and is a marked evidence of commencing softening in the tubercular deposits of phthisis, in the subclavicular region. *Moist crackle* or *humid clicking râle* is significant of liquefaction of tubercular nodules in connection with a bronchial tube, and as liquefaction advances by the increased softening and breaking down of these deposits, these crackles or clicking râles develop into the gurgling or cavernous râle of the late stage of phthisis.

The chest in health on being percussed gives everywhere a clear reply; the note on both sides being similar in similar situations, unless where on the left side the heart intervenes. In the course of some diseases it will be found that one side is more expanded or retracted than the other, and it is necessary to estimate the exact difference between them. For this purpose mark with ink the central spots over the spinal vertebræ and the sternum, and stretch a graduated tape between them on both sides, telling the patient to hold his breath during the experiment. In cases where there is any difference, note whether it increases or diminishes at regular periodical visits.

Vocal fremitus is the peculiar thrilling sensation conveyed to the hand applied to the chest when the patient speaks. With regard to this it is to be noted that the sensation in health varies according to sex and age. It is heard better in the deep tone of a man's voice than in the higher pitched tone of a woman or child. It is also increased in consolidation of the lung tissue by disease, as in the second stage of pneumonia, provided the bronchi are patent, and it is diminished or lost in pleurisy with effusion on account of the fluid between the lung and the chest-wall.

The chief points to be attended to in forming a *diagnosis* as to diseases of the respiratory system are as follows :—

1. *Inspection.*—Shape of chest—normal, barrel-shaped, bulging, or shrinking; respirations—character and amplitude, and rate per minute, with also the pulse-respiration ratio.
2. Antecedent history; dyspnœa; cough, expectoration; localised pain.
3. *Percussion.*—Clear; hyper-resonant; dull. If dulness at base, whether absolute or not; if at apex, whether attended with abnormal sounds as metallic or cracked-pot.
4. *Auscultation.*—(Respiratory murmur); tubular; moist or dry; general or localised; râles; crepitation coarse or fine.
5. *Palpation.*—Fremitus—increased, diminished, or altered.
6. *Mensuration.*—If one side of the chest be expanded or retracted. Mark the difference on each side by a measurement from vertebræ to central spot on sternum by means of cyrtometer.

CATARRH

We have commenced, and, to a certain extent, illustrated in the preliminary remarks the effect a cold has upon the chest when it attacks the mucous membrane of the respiratory tract. It may, however, stop at the head, affecting only the nose (coryza) or the frontal sinuses (gravedo), giving rise at first to dryness, and afterwards to what is termed running at the eyes or nose, and a profuse muco-purulent discharge. The concomitant general symptoms vary from weariness and stuffiness of the head to actual headache and some distinct feverishness, with inability to attend to ordinary duties.

The aim in treatment is to endeavour to keep the catarrh at its place of origin. How are you to stop a cold ? Catch it at its commencement, and treat it by an opiate. Twenty drops of tincture of opium, or ten drops of liq. morph. and eight of vin. antimon. given twice at an interval of three hours, will usually accomplish this. A simple and effective method has also been suggested—viz. to forbid the use of any kind of liquid for twenty-four or forty-eight hours. In this way the materials for flux are minimised, and it dies of inanition. A Turkish bath can also be recommended. Spirit of camphor sprinkled on a handkerchief and inhaled quickly checks the running at the eyes and nose, and may be repeated if it occurs. Inhalation from a menthol cone is also very advantageous, or brushing the inside of the nostrils with an ointment of cocaine 1, menthol 1, and vaseline 10 parts. For "nasal catarrh," when the posterior nares is affected, a spray of menthol, camphor, ol. eucalypti (F. 52*b*) used morning and evening has an excellent effect. Quinine x. grains is also highly recommended as checking incipient catarrh. It may be given suspended in milk. For "chronic sneezing," peculiar to some people in the early morning on leaving their bedrooms, or on entering a cold room, the same remedy can also be recommended, or the inhalation of alum, 10 grs. to the ℥i. of water. The iodised steam arising from 30 to 40 drops of tincture of iodine placed in two pints of boiling water may also be inhaled night and morning for five minutes.

LARYNGITIS, ETC.

The extension of a common cold to the larynx, leading to congestion and slight inflammation of the mucous membrane, is by no means uncommon. It is evidenced by hoarseness, soreness in drawing in the breath, and a dry, tickling cough, and is attended with no danger. "Acute phlegmonous laryngitis" is a much more severe, and fortunately a rarer, affection. It is peculiar, generally speaking, to adults, and due usually to exposure to cold or wet, or to the inhalation of vapours or dust. Œdema of the glottis, culminating in "acute laryngitis," may be produced immediately by the fumes of irritating gases, and by the accidental swallowing of boiling water. In whatever way "acute laryngitis" originates, its symptoms are well marked. Thus, there is pain in the region of the larynx, notably at the pomum Adami, and this pain is increased by pressure externally, while internally there is a feeling of great dryness and soreness, and a sensation as if the passage was narrowed. The inspiration is protracted, wheezing, and laborious, the expiration comparatively easy, the voice hoarse or altogether lost, the cough imperfect and brassy, and attended with hardly any expectoration. Accompanying these local symptoms of "acute laryngitis," chilliness and more or less fever are found to usher in the disease, except it be of traumatic origin. The face is full and flushed, but if the disease advance unchecked, it becomes pale or livid, while the pulse is feeble and irregular; restlessness is intense and accompanied by a feeling of suffocation — which actually does take place unless relief is afforded—with drowsiness, delirium, and coma. The patient dies asphyxiated, and this, as the symptoms indicate, is due to the rima glottidis having become so swollen as to be reduced to a mere chink, while there is inflammatory effusion into the subjacent areolar tissues. If a laryngoscopic examination can be made, the mucous membrane of the larynx will be observed to be red and swollen, being most markedly so at the aryteno-epiglottidean folds or the false vocal cords, or at the epiglottis, where all view may be obstructed. The course of the disease is rapid, sometimes carrying off the patient in twelve hours, or at all events before the fifth day. At other times recovery ensues; or the affection may pass into *chronic* laryngitis.

Treatment.—In laryngitis due to and accompanying a common cold, and hence better termed "laryngeal catarrh," it is essential that all talking or undue exercise of the voice should be prohibited; that the patient should keep to his room, which should have a uniform temperature of 63° to 66° F.; that a mild diaphoretic mixture should be given (F. 31), and that the cough should be relieved by inhalations (F. 52), or by a spray solution of bromide of potassium or chloride of sodium, 20 grains to the ounce.

In "acute laryngitis," properly so called, leeches should be applied directly to the larynx of adults or the manubrium sterni of children; or hot-water compresses may be employed, and covered with india-rubber cloth, or the patient may suck ice. Scarification of the swollen parts by a curved bistoury protected to within a quarter of an inch of the point has been followed by relief of the severe paroxysms. Should, however, marked stenosis occur, and the local means mentioned aided by inhalations fail to give relief, tracheotomy ought to be performed without delay; and thus rest will be allowed to the inflamed part, and relief to the engorged lungs.

CHRONIC LARYNGITIS

Chronic laryngitis may be defined as a low persistent inflammation of the mucous membrane and glandular structures of the larynx, occasionally confined to the glandular structures alone.

The SIMPLE form depends on a too early use of the voice after acute laryngitis, and it may also follow "over-feeding." A peculiar variety called "follicular," "glandular," or "clergyman's sore throat" results from habitual exertion or straining of the voice, sometimes coupled with excessive use of alcohol and tobacco. SPECIFIC forms of chronic laryngitis are observed in syphilis aud tubercular diseases.

Anatomical Characters.—The mucous membrane is swollen and hyperæmic; the vessels are dilated, usually in patches; the vocal cords may be congested; but ulceration is rare in simple chronic laryngitis. In the variety called "clergyman's sore throat" the racemose glands are hypertrophied at the base of the epiglottis and on parts of the ventricular bands, the surrounding vessels dilated, the ducts and culs-de-sac enlarged, and their orifices closed, so that the secretions accumulate, and this accumulation may lead to ulceration. Usually the follicles of the pharynx are in a similar condition.

Symptoms.—The symptoms of chronic laryngitis are hoarseness, loss of voice (aphonia), a persistent dry cough, with little expectoration, a sense of dryness with slight pain in the throat, and occasionally dyspnœa after exertion.

Prognosis.—The disease may sometimes subside spontaneously, but usually it is obstinate, and only yields to well-directed treatment. Especially is this the case with the variety termed "clergyman's sore throat."

Treatment.—Absolute rest of the voice is essential. Errors of diet and hygiene must be corrected. In the somewhat acute cases the larynx should be brushed every other day with a strong solution of nitrate of silver, 40 grains to the ounce; medicated sprays should be used daily and a solution of tannic acid and alum, or steam of boiling water containing ʒi. of tincture of iodine, or 10 drops of pine oil dissolved in spirits, in the pint of water. In the mild chronic cases of "clergyman's sore throat" gargles are of much service, as glycerin of carbolic acid, tannic acid (F. 48*a*), or tincture of myrrh and alum (F. 48). Inhalations of steam or the local application of glycerin of tannin are also beneficial. Ammonium chloride lozenges (Wyeth's) or Soden pastilles in some cases relieve tickling cough and promote expectoration, or in other cases astringent lozenges are more useful, such as rhatany, catechu, and tannin with capsicum.

TUBERCULAR LARYNGITIS

(*Synonym*, Laryngeal Phthisis)

A chronic disease of the larynx depending upon the presence of tubercle, almost invariably associated with pulmonary tuberculosis, and very rarely observed as a primary disease, *i.e.* where no tubercular lesions are present in the lung. It is met with in about 30 per cent of the cases of pulmonary tuberculosis, and it seems probable that syphilitic ulceration of the larynx may predispose to laryngeal tuberculosis by affording a good nidus for the development of the tubercle bacillus.

Anatomical Characters.—Minute deposits of miliary tubercle are found in the mucous membrane, causing at first slight eminences, which become the seats of ulceration. By extension to deeper parts, fibrous tissue is involved; articulations suppurate, and cartilages are destroyed. The first cartilage attacked is the epiglottis, then the arytenoid and the cricoid. Occasionally abscesses result.

Symptoms.—The symptoms are *local* and *general.*

Local.—Hoarseness is an early symptom of the disease and frequently passes on to complete aphonia. Cough and expectoration are invariably present as the result of the combined laryngeal and pulmonary affection. As the disease progresses difficulty of swallowing is experienced, which is dependent upon the swollen and ulcerated condition of the larynx.

General.—To these local symptoms are added the waste and decline associated with tubercular disease.

Diagnosis.—Pallor of the mucous membrane is very characteristic and should arouse suspicion. The first change is tumefaction of the mucous membrane, which is dull grayish yellow in colour, and becomes studded with small yellow tubercles which break down and coalesce to form irregular superficial ulcers. The ulcers are grayish yellow and covered with a tough gray secretion. There is no marked excavation. The surrounding mucous membrane is swollen and bloodless. The discovery of tubercle bacilli in the sputum, or of tubercular lesions in the lung, favours a diagnosis of tubercle. Syphilitic ulcers are covered with yellow purulent discharge, and the surrounding mucous membrane is reddened and usually not so swollen. In diagnosing it from malignant disease, age is an important factor, for malignant disease is rare under thirty-five, whereas laryngeal phthisis is most common between the ages of twenty and thirty.

Treatment.—The *constitutional* treatment is similar to that mentioned under phthisis, except that high altitudes prove injurious, and a warm equable climate should be selected.

The *local* treatment is very important, and considerable advance has been made in recent years, especially in the relief of symptoms, in the destruction of the morbid tissues and the promotion of cicatrisation of the ulcers. Dysphagia can be relieved by cocaine applied in a 5 to 10 per cent solution by means of a spray apparatus or a brush, five minutes before a meal is taken. Wolfenden states that the difficulty in swallowing fluids, which attends loss of the epiglottis by ulceration, may be obviated by placing the patient prone across the bed, with the head hanging over the side, and allowing him to suck milk through a piece of india-rubber tubing from a glass placed on the floor.

Painting the ulcerated surface with a 5 to 20 per cent solution of menthol in olive oil has a marked anodyne effect and promotes the cicatrisation of the ulcer. The insufflation twice daily of a powder containing iodoform and boric acid, 1 grain of each, and hydrochlorate of morphine, after cleaning the surface of the ulcer with an alkaline spray, can be recommended. Lactic acid in a 20 to 60 per cent solution is useful for destroying infiltrated tissues and promoting cicatrisation of the ulcer. The pain attendant upon its use may be lessened by previously painting a 20 per cent solution of cocaine over the mucous membrane, and by the use of gargles of iced water and cold compresses.

Cancer of Larynx.—The larynx sometimes becomes affected with cancer by extension of the disease from the pharynx or base of the tongue. As a *primary* affection it begins in the laryngeal mucous membrane, the original sites being usually one of the cords, one of the ventricles of Morgagni, or one of the false cords. As the disease spreads extensive ulceration occurs, and from the ulcerated surface an abundant purulent discharge mixed with blood results, or there may be copious hæmorrhage. Death may be due to œdematous laryngitis, pneumonia, or empyema. The most constant and the earliest symptom is *hoarseness*, next to hoarseness is *pain*, localised or referred to the pharynx or radiating into one or other ear. *Dyspnœa* and *dysphagia* come on sooner or later. The cervical glands in the course of the disease become enlarged. The *treatment* can only be palliative. Tracheotomy is required, and the duration of life after this operation is about twelve months. The results from "total extirpation" of the larynx are not encouraging.

Perichondritis of Larynx.—The perichondrium of the larynx is a fibrous membrane, which surrounds and protects cartilage as periosteum does bone. Through impaired nutrition it may undergo degenerative changes, and thus may be affected *primarily* by inflammation ; or ulceration begins in the mucous membrane and involves *ultimately* the perichondrium. It occurs between the years of thirty and fifty, and is more common in males than females. The *symptoms* at first are similar to those of subacute or chronic laryngitis, as evidenced by hoarseness, loss of voice, cough, difficulty in swallowing, and localised pain. As the disease progresses, dyspnœa becomes extreme, and suffocation is rendered imminent. Sometimes this is averted by spontaneous evacuation of the abscess cavity, and recovery. At other times the discharge pours into the air-passages, reaches the lungs, and originates rapid gangrenous pneumonia. Perichondritis may be limited to one of the cartilages of the larynx or it may affect all. If detected early, leeches may be applied to the larynx, or ice may be locally used. These means may abort the inflammatory process, but if this goes on, an abscess forms outside or inside the larynx. When detected it should at once be opened. In most cases tracheotomy is required. If stenosis results from cicatricial contraction, the canula may require to be worn permanently.

Œdematous Laryngitis (*Synonym*, Œdema Glottidis).—Œdema may occur in the course of acute or chronic laryngitis, and may complicate exanthematous affections. It may follow on scalds from drinking boiling fluids, and it sometimes occurs in the course of Bright's disease.

Course and Symptoms.—There is inflammatory exudation into the submucous areolar tissue of the larynx of serous, sero-purulent, or sero-gelatinous fluid, attacking first the epiglottis and subsequently extending to the other parts of the larynx, with the exception of the vocal cords. It is attended with difficulty of swallowing and breathing. An examination shows the epiglottis rounded and swollen like a chestnut, or the sides are distended so as to resemble two mucous bladders pressed together in the middle line.

Treatment.—The treatment is indicated under Acute Laryngitis.

Polypus of Larynx.—The growth is at first harmless, and may not attract attention until it attains some size, when difficulty of breathing sets in, with a dry, croupy, spasmodic cough, and with a modification of the voice. The polypus is recognised from a laryngoscopic examination, and as it rarely disappears spontaneously, an operation becomes necessary.

Treatment.—If attacked by the mouth, the polypus may be torn off by the forceps, or cut by knives, or crushed by an ecraseur. Should the growth be very large, thyrotomy (division of both thyroid and cricoid) may be necessary, and through the artificial opening the growth or growths may be removed.

NEUROSES OF LARYNX.—Sensory Neuroses.—*Hyperæsthesia* of the laryngeal mucous membrane may accompany acute or chronic inflammation, or it may be a hysterical symptom.

Anæsthesia occurs as a sequel of diphtheria, or when the superior laryngeal nerve or its centres are affected. It is usually associated with paralysis of the muscles of deglutition, and of the depressors of the epiglottis, and leads to food passing into the larynx, which is deprived of its reflex sensibility.

PARALYSIS OF THE LARYNX.—Loss of power in the laryngeal muscles depends on various causes. Thus paralysis of the superior laryngeal nerve, supplying the crico-thyroid muscle, in addition to the anæsthetic symptoms previously mentioned, prevents due tension of the vocal cords, and establishes loss of voice.

Complete paralysis of the muscles supplied by both recurrent laryngeals, the motor nerves of the larynx, causes the vocal cords to become fixed and immovable; but disease or pressure on one of these nerves paralyses only certain groups or individual muscles.

Perhaps the most common lesion is paralysis of the ABDUCTORS (posterior crico-arytenoids, etc.), causing the vocal cords to lie near each other in the middle line, in a relaxed state. This serious state of matters during respiration leaves only a narrow space, causing very harsh breathing, and marked inspiratory dyspnœa.

Paralysis of the ADDUCTORS, when one or both cords are seen at all times relaxed and drawn aside, leads in the latter case to complete want of voice, and in the former to aphonia more or less pronounced, but is not necessarily accompanied by much difficulty of breathing. When these conditions remain long the muscles become atrophied.

These varieties of paralysis are recognised by the laryngoscope, and familiarity with this instrument is essential for pronouncing a diagnosis of laryngeal paralysis.

Treatment.—The pressure of an aneurysm or enlarged cervical or bronchial glands or other tumours on the nerve-trunks renders treatment of little avail. It may be necessary to perform tracheotomy to avert for a time asphyxia. Electricity, from the nature of the case, in many instances could be of little use, if the cause is rightly apprehended, and reported cures are probably those of feigned, not real, disease.

Syphilitic Disease of the Larynx.—In the advanced stages of syphilis following upon a severe attack, the larynx may be seriously affected with tubercles or ulceration.

Symptoms.—The disease is associated with little pain, fever, or dyspnœa, but it is attended with hoarseness and loss of voice.

Treatment.—It yields to the syphilitic treatment by mercury mentioned at p. 116. The ulcers should be touched with strong solutions of nitrate of silver, or, if isolated, by the solid stick. Iodine inhalations are also beneficial.

LARYNGISMUS STRIDULUS

(*Synonyms*, Spasm of the Glottis, Spasmodic or Spurious Croup) is seen chiefly in rickety children under two years of age.

Etiology.—It may originate from the brain, as in hydrocephalus; from direct irritation of the vagus or recurrent nerves; from tumours or enlarged thymus gland; from reflex causes, such as dentition, worms, improper feeding; or from fright or anger. It is essentially neurotic and non-inflammatory.

Symptoms.—The attack is sudden, usually occurring at night and during sleep, and is characterised by one prominent symptom, dyspnœa. No air enters the glottis for the moment, and respiration seems to cease. The child struggles for breath, as if it were about to die from suffocation, and then, with a sudden relaxation of the spasm, the air is drawn into the lung with a high-pitched crowing sound, which has given to the affection the name of "child-crowing." There may be also convulsions and a contracted state of the flexor muscles of the thumb, fingers, and toes (carpo-pedal spasms).

The paroxysm ceases suddenly, but may be succeeded by others, and death sometimes takes place through suspended respiration, or by stagnation of the blood in the lungs, heart, or brain. The train may be laid for serious after-results, and although termed spurious croup, the disease is not free from peril.

Diagnosis.—IT IS CHIEFLY DISTINGUISHED FROM TRUE CROUP BY ITS SUDDEN ACCESSION AND SUDDEN DEPARTURE, BY THE FREEDOM OF BREATHING BETWEEN THE PAROXYSMS, AND BY THE ABSENCE OF FEVER, HOARSENESS, AND ANY ATTENDING COUGH OR INFLAMMATION.

Treatment.—During the paroxysm place the child in a warm bath, apply a sponge squeezed from hot water to the throat, and, after the infant is taken from the bath, or before it, sprinkle the face and chest with cold water. The cold sprinkling arrests the paroxysm for the time; if it fail to do so, chloroform should be inhaled; and to avert the recurrence of convulsions, should these be associated with the attack, bromide of potassium should be given combined with syrup of chloral (F. 69); or if there be no convulsions, bromide of ammonium in a dose of three or four grains twice daily.

As further prophylactic remedies, adopt the treatment recommended in rickets; sunlight, fresh air, good food, cod-liver oil with oil of phosphorus (F. 91*c*). Regulation of the bowels is necessary, and lancing of the gums, if these be hot and tender, is occasionally useful.

FALSE CROUP.—We think it advisable here to speak briefly of an affection of the air-passages attended with spasm of the glottis, but with the formation of no false membrane, and which has been termed Spasmodic Laryngitis or False Croup. It is preceded by some signs of catarrh for a day or two, as evidenced by cough and hoarseness, and in the middle of the night the child affected wakes in great terror panting for breath. Each inspiration is accompanied by a loud crowing sound, and the cough is hoarse and barking. But the attack, though alarming, is not dangerous, and the paroxysms of coughing abate in half an hour or an hour or two hours, and the child falls asleep. For a night or two after this the symptoms may return, but not in such a severe form as in the first attack. Mothers speak of this disease when they say "their children are liable to croup." The *pathology* of this false croup is doubtful, but it most probably depends upon a slight catarrhal inflammation of the laryngeal mucous membrane, which is attended or complicated by spasm of the muscles of the glottis. There is no necessity for active *treatment.* An emetic of 60 minims of ipecacuanha wine, repeated every ten minutes until vomiting occurs, does good, and the application to the throat of a sponge squeezed out of hot water.

BRONCHITIS

is essentially an inflammatory affection of the bronchial mucous membrane, and may be either acute or chronic.

It is caused by exposure to cold or wet, local irritation from mechanical operations, *e.g.* needle-grinding, or it may be dependent on heart disease, or associated with various constitutional affections, such as rheumatism, gout, fever, Bright's disease. It is most common in childhood and old age.

Two varieties of acute bronchitis have been recognised.

1. When the larger and medium-sized air-tubes are alone affected.

2. When the inflammation does not stop there, but involves all the bronchial ramifications—capillary or general bronchitis.

The last form is rarely seen in adults, but chiefly among young children and old people, and is frequently fatal.

Symptoms and Course.—Certain general symptoms accompany both varieties. Thus, there are chilliness, fever, running at the eyes and nose, and general malaise. The extension of the inflammation down the respiratory tract causes irritation of the mucous membrane of the larynx and trachea, which is evidenced by a sense of tightness behind the sternum, and a tickling sensation about the windpipe. The expectoration is at first dry, and difficult to bring up, scanty, white, and frothy; but in the course of a few days, or a few hours, it increases in quantity; and if the attack be severe or prolonged, it becomes muco-purulent.

In the more severe form the symptoms, corresponding to the gravity of the case, are more urgent. The restlessness is great, the fever high, anxiety is depicted on the countenance, and the impaired and impeded circulation through the right side of the heart is evidenced by the livid lips; and this lividity sometimes extends over the body, and is observed at the finger-ends. Should the disease terminate favourably, there is a gradual remission in the severity of the symptoms. The fever decreases. Respiration becomes easier, the cough less troublesome, and the expectoration freer. But if a fatal termination is likely, the symptoms increase in intensity. Unable to sit up in bed, the patient sinks exhausted on the pillow. The breathing is thus more difficult, and the lividity becomes more intense. There is not the power to bring up the mucus, which accumulates in the air-passages, and thus the patient dies from suffocation, or apnœa, due to the arrest of the circulation through the lungs in consequence of the coagulation of blood in the pulmonary arteries, and in the right cavities of the heart.

On auscultation during the first or dry stage of bronchitis we detect two coarse, rough, dry sounds all over the chest. The air-tubes are narrowed, but the air does not come through mucus: hence the dryness of the sounds, which are termed sonorous rhonchi if the larger tubes are implicated, sibilant rhonchi if the smaller ones are involved. Percussion in this stage is clear.

When the secretion of mucus commences, these dry sounds are replaced by large bubbling in the larger air-tubes, or small bubbling if the disease has reached the smaller tubes. This has been termed the moist stage of bronchitis, and the sounds then heard have been technically called large and small crepitations.

Percussion may now sometimes detect dulness through œdema at the base of either lung; while, if there be pulmonary collapse through tenacious mucus plugging up a bronchial tube, as not infrequently happens, the percussion note will lack resonance over that particular part.

Prognosis.—From one-half to three-fourths of those attacked with capillary bronchitis die between the sixth and tenth days of the disease. In favourable cases improvement commences from the fourth to the eighth day. Bronchitis affecting the larger air-tubes is not dangerous. Relief generally supervenes when expectoration becomes abundant. Should this be very deficient, pulmonary congestion ensues, and ultimately death. Circumstances increasing the gravity of the prognosis are very early or advanced life, the existence of some acute or chronic disease, or other complications.

Anatomical Appearances.—The morbid appearances directly indicating bronchitis as a distinct affection may be summed up in one word — redness, which may, however, vary in intensity. With the redness there is swelling, and at first dryness, of the mucous membrane. The dryness is afterwards replaced by a muco-purulent secretion.

Treatment.—It is not easy to lay down any general rule for the treatment of acute bronchitis. Yet it may be said that in the early catarrhal stage, when the large tubes only are affected, the administration of a full dose of opium (in wine or whey) or of quinine, with the application of jacket poultices of linseed meal, often checks the disease. If the fever be intense and if the inflammation has extended, then small doses of vinum ipecacuanhæ, frequently repeated, are serviceable in rendering the mucous membrane moister. The application also of hot flannels sprinkled with turpentine to the throat and upper part of the chest, or mustard poultices, give marked relief. The patient should be kept in bed and the temperature of the room maintained at 65° F. But if the case be one of capillary bronchitis, more energetic measures are necessary. Vinum antimoniale is the best medicinal agent in many cases, and should be given in expectorant and diaphoretic doses until diaphoresis sets in and the expectoration becomes freer, when its administration should be stopped and replaced by carbonate of ammonium with tincture of squill and infusion of senega (F. 44). There are, however, other cases where a depressing remedy is inadmissible and cardiac stimulants from the first form the only chance of averting a fatal issue. Of these the administration of turpentine in extreme cases seems to afford the only chance of arresting a fatal result, and it should then be given in alternate doses with champagne. Mustard or turpentine must be applied locally until the surface is thoroughly reddened.

A moist state of the air round the patient is of great importance, and for this purpose a kettle on the fire with a long tube throwing steam out near the bed suits better than anything else. Ipecacuanha spray acting directly on the lungs also gives much relief. It is to be noted that the temperature of the room should be kept at a constant level, for a fall of a few degrees, in a room saturated with moisture, will occasion a chill which may be fatal to the patient.

If the disease progresses favourably, the steam and the spray should be stopped and the mixture of carbonate of ammonium previously mentioned ordered.

Dietetics.—The diet should be fluid. In ordinary cases, milk, beef-tea, arrowroot, and gruel are sufficient, but in capillary bronchitis of young and old persons it is necessary to add wine or brandy in doses proportionate to the ages of the patients.

CHRONIC BRONCHITIS

sometimes follows the acute form, or is the result of general bad health, or the sequela of what are termed coughs and colds. It is common in advanced life, appearing in wintry inclement weather, and disappearing in summer. It may vary in its severity, at times being attended with little or no uneasiness except a slight cough and some expectoration; in other cases the cough is very harassing, especially in the morning, the expectoration copious and resembling very much the nummular sputa of phthisis, or it may simply be frothy and muco-purulent. Fresh exposure to cold or atmospheric changes may at any time convert chronic into a dangerous form of acute bronchitis.

Chronic bronchitis is sometimes dependent on certain constitutional diseases, as syphilis, gout, rheumatism. It also specially affects workers at certain occupations; *e.g.* knife-grinders, miners, cotton operatives, etc. Auscultation after free expectoration reveals loud harsh sounds all over the chest. These are best described as snoring. They vary in their intensity according as the air-passages are well cleared from mucus, or the reverse. In advanced cases the respiration is of a hollow blowing character, and attended with gurgling. Percussion is unaltered unless there is a great accumulation of matter to be expectorated, when it may be temporarily dull over a particular spot. As the disease advances, chronic bronchitis is associated with emphysema, with all its consequent symptoms; for, dependent on an impeded pulmonary circulation, dyspnœa becomes a pronounced symptom. Further, the pulmonic obstruction causes venous congestion, and dilatation of the right ventricle with tricuspid insufficiency, and on these follows the whole train of symptoms characteristic of general passive hyperæmia.

BRONCHIECTASIS. — Sometimes, as the result of various chronic lung affections—as bronchitis, emphysema, or interstitial pneumonia—a bronchial tube may become so dilated as to form a single pouch, like an aneurysm of an artery, or a series of pouches in the same tube. This condition is termed Bronchiectasis, and if the cavity is near the surface, is surrounded by condensed lung, and contains air as well as liquid, the signs will be identical with those of a phthisical cavity, and can only be distinguished from it by the fact that such dilatations are usually found in the middle and lower parts and not at the apices of the lung; by the absence of bacilli in the expectoration, which is abundant and fœtid, and by the breath being very offensive.

The sputum is brought up in enormous quantities during violent paroxysms of coughing. These are most frequent in the morning, and for the rest of the day the patient may be comparatively free from cough. In some cases of extensive saccular dilatation mere change of position may be sufficient to bring on a paroxysm. On standing, the sputum separates into three layers—an upper frothy, a middle clear, and a lower granular opaque layer. Ulceration of the mucous membrane may lead to repeated small hæmorrhages.

PLASTIC BRONCHITIS. — A peculiar form of bronchitis, occurring either in an acute or chronic form, but much more frequently in the latter, is called variously "croupous," "plastic," or "fibrinous." It is very rare, and occurs more frequently in males than in females, between the tenth and the thirtieth years of life. It is attended with the ordinary symptoms of bronchitis, and has only one certain diagnostic sign, THE EXPECTORATION OF BRANCHING BRONCHIAL CASTS. Recovery in the chronic form is the rule, although the disease is apt to recur.

Treatment of Chronic Bronchitis.—Indications for treatment vary according to the different forms of Chronic Bronchitis, but, in all cases, are based on certain obvious principles. The patient should always be well clad, flannel being constantly worn, and he should be exposed as little as possible to the vicissitudes of the weather. During winter, if circumstances admit, the patient should reside where the climate is mild and dry. In addition, an attempt must be made to relieve the cough, to promote or restrain free expectoration, and subdue spasm. In slight cases with little cough and free expectoration, soothing expectorants, as tinct. camph. co., syr. of tolu and mist. ammoniaci may be ordered (F. 43), or inhalations consisting of medium solutions of alum or tannin, either alone or with common salt.

In cases where the cough is *considerable* and the expectoration *scanty*, astringent medicines would only increase the distress, and hence it is advisable to order remedies which will promote liquefaction of the mucus and moisten the dry mucous membrane. Carbonate of ammonium is here specially useful, not merely for its action on the bronchial tubes, but for its general influence on the system. About 45 grains should be given in twenty-four hours; a convenient method being 6 grains every three hours, with 10 minims of sp. chloroformi, and 30 minims of syrup in one ounce of camphor water. Perspiration and an increased flow of urine are thus induced with relief of the dyspnœa and liquefaction of the expectoration. Iodide of potassium also does good service in making the expectoration more free; copaiba and the balsams of Peru and tolu are useful. Wyeth's chloramine lozenges are without doubt most valuable expectorants, especially in the morning cough of this affection.

In *checking the expectoration* when excessive, tincture of benzoin or dilute sulphuric acid and other preparations may be employed (F. 21). Inhalations of steam, alone, or charged with hops or with dilute hydrocyanic acid or pine oil, are serviceable in moderating *cough* and *spasm.* Nitro-glycerin internally or the nitrite of amyl inhaled also alleviates the dyspnœa. In chronic bronchitis German authorities speak highly of compressed or rarefied air. Waldenburg has invented a machine for the purpose of making the patient inspire compressed air or expire into rarefied air; the directions being that compressed air should be inspired for five, ten, or fifteen minutes, and then after a pause, that expiration into rarefied air should be practised for a similar period. The range of additional or diminished pressure seldom exceeds $\frac{1}{40}$ or $\frac{1}{30}$ of an atmosphere, and in some instances is not more than $\frac{1}{60}$ or even $\frac{1}{120}$ of an atmosphere. The effect of this mode of treatment is progressive retraction of the pulmonary tissue, increased elasticity of the lungs, diminished frequency of respiration, less engorgement of blood in the venous system, and in consequence disappearance of œdema, if that has begun.

The treatment for *bronchiectasis* consists in disinfecting the secretions which are formed in the bronchiectatic cavities and in promoting their discharge. For destroying offensive secretions and for diminishing the constant state of irritation so produced, Skoda recommended inhalations of oil of turpentine. Energetic fits of coughing are produced by its action, and consequent dislodgment of the secretions formed in the cavities. When the secretions become less offensive the turpentine inhalations may be replaced by solutions of 3 per cent of alum and tannin, and these inhalations must be persevered with for a considerable period. Sir T. Grainger Stewart recommends an intra-tracheal injection of ʒi. twice daily of a solution which consists of menthol 10 parts, guaiacol 2 parts, olive oil 88 parts. He also gives the details of a case in which complete recovery followed the incision and drainage of a bronchiectatic cavity. In *Fibrinous Bronchitis* emetics are indicated after hot inhalations, to remove the branching casts in the bronchi. Iodide of potassium is also specially serviceable for this, as the casts are said to become loose even on the second day of its administration. There is no remedy as yet known which will prevent its recurrence.

Climatic and Dietetic Treatment.—The health resorts of Bournemouth, Penzance, Torquay, and the Isle of Wight are useful in winter for chronic bronchitis; so also are Cannes, Hyères, Mentone, Meran, and Madeira. The inhalations of the waters of Ems and Lippspringe can also be highly recommended. The food taken should be light and easily digestible. Heavy meals should be avoided, and in patients with this disease who are inclined to obesity, the treatment recommended for obesity should be adopted. The bowels should be carefully regulated by dietetic remedies, as stewed prunes or figs and brown bread, or by mild laxatives, as Carlsbad Salts or Hunyadi Janos water.

EMPHYSEMA

In forming a conception of the nature of Emphysema we think it advisable to look first at the condition of the lungs as seen in the dead body of a person who has been emphysematous. We recognise its presence by observing that the lungs are not collapsed when the chest is opened. They appear like down pillows to fill the thorax and overlap the heart. We observe the apices above the clavicles and their bases bulge on the diaphragm, so that instead of being arched upwards it has a flattened surface. We touch the lung and we find it has a peculiar soft feel; if we squeeze it between the finger and thumb it does not crepitate; and if we make pressure on its surface a deep pit is left when the pressure is removed. The impression received from such observations is that the lungs have lost their elasticity, and that they are bloodless; and this impression is not removed but confirmed by a close examination. We find that the air vesicles are dilated, that the alveolar walls are wasted, that the capillary blood-vessels which are distributed on the walls of the air vesicles are shrunken from the pressure of the vesicular dilatation, while the larger interlobular vessels are thickened and distended with blood. In the description given we have had to do with "hypertrophous emphysema," and in contradistinction to this hypertrophous form we have another which is termed "atrophous" or "senile." The lungs are smaller than natural. They do not fill the thorax after death; on the contrary, they collapse quickly when the thorax is opened. If we examine such lungs we find that the change is essentially senile, that there is atrophy of the several structures of which the air vesicles are composed, and that several of the vesicles are thrown into one.

Etiology.—The cause of this atrophous form of emphysema is thus easily understood, but in Hypertrophous Emphysema we come to debatable ground, which centres round an inspiratory or expiratory cause.

We can better understand the reasoning on which a decision is based in favour of the expiratory theory by comparing healthy breathing with what happens when forced expirations are made. In quiet healthy expiration an escape of air occurs into the bronchi from all the lobes alike without muscular contraction, and is due to the contractility of the lungs, the weight of the thoracic wall, and the elasticity of the intestinal gases and the abdominal muscles: whilst, on the other hand, in forced expiration the auxiliary expiratory muscles, which, however, do not extend above the fifth rib, are also brought into action. With a closed glottis the air within the chest is subjected to an increased pressure, which bears upon the alveolar walls in all directions. To this increased pressure the thoracic walls exercise counter-pressure, and it is precisely where this counter-pressure does not exist—viz. at the apices, the alveoli of the anterior margin of each lung, the margin at the base of the lung, the part of the lung near its root below the entrance of the bronchus—that emphysema forms. In addition to the respiratory forces a malnutrition of the lung tissue has to be reckoned with; and in the generalised form of the disease such a nutritive change is by most observers regarded as the starting-point. Recent observations have shown that the pulmonary nerves are extensively wasted in such cases, and to this circumstance it is possible to attribute the degenerative change. This change consists in a granular fatty degeneration of the structures forming the walls of the cells.

Symptoms and Course.—As a rule repeated winter cough, or bronchial catarrh accompanied by little expectoration, precedes emphysema. This catarrh lasts through the winter and disappears during summer. Chronic bronchitis cannot exist long without being associated more or less with emphysema, so that it is impossible to separate the effects of the two lesions (Fagge). In some cases emphysema appears to be more rapidly developed with some other disease of the respiratory tract, as hooping-cough or pneumonia; or dyspnœa may be the first prominent symptom, followed by cough and further evidences of emphysema, a history found in severe straining of the respiratory organs in connection with certain occupations, as playing on wind instruments or lifting heavy weights, or the disease may be hereditary. In the two latter forms many years may be passed without much annoyance, until, as time advances, gradual occurrence of shortness of breath attracts the attention of the patient, and advice is sought. In the higher grades of the affection a physical examination brings out important points. The thorax is sometimes enlarged in all its dimensions, but most commonly the enlargement is but partial, and it particularly involves the upper and middle portions; whilst the lower part is either *contracted*, *normal*, or rarely somewhat *enlarged* (the barrel-shaped thorax). The thorax is held in a position of permanent inspiration. There is, during respiration, little true expansile movement; though the whole thorax is forcibly elevated it does not expand much. The gait is stooping, the intercostal spaces are wide and flat, and the muscles flabby. The pulmonary boundaries are enlarged, and the liver occupies a relatively lower position. There is a diminished area of cardiac dulness, with epigastric pulsation and lack of the apex beat. Auscultation shows the inspiration as short and quick, the expiration prolonged and *wheezing*; percussion reveals exaggerated resonance or dull tympanicity (Gairdner). The countenance is livid and cyanotic, the nostrils are dilated, and the voice is feeble.

The course of the disease in a typical case described goes on from bad to worse; the symptoms become aggravated, often from bronchial catarrh or by the supervention of asthma; sometimes by indigestion, causing flatus and the pushing upwards of the diaphragm. There are also great wasting and marked debility; the circulation becomes embarrassed with or without valvular disease: more or less venous congestion is apparent, ending in general dropsy, and ultimately in exhaustion and death.

Prognosis.—When of acute origin, resulting from hooping-cough or strain, recovery may take place, but in other cases there is no probability of a recovery; for the distended and bloodless vesicles can never regain their shape or natural structure. The duration and the intensity of the disease depend much on the surroundings and circumstances of the patient, and if these are favourable fairly good health may be maintained for some years.

Treatment.—The therapeutic, hygienic, and climatic treatment alluded to under Chronic Bronchitis is in the main applicable to emphysema (p. 170). In addition may be mentioned arsenic internally or in the form of Trousseau's cigarette: hypophosphite of lime (F. 82); Easton's syrup; iodide of potassium (F. 5). The injection of apomorphine in some cases where I tried it acted well. Free vomiting occurred in about ten minutes, which was succeeded by gentle perspiration and refreshing sleep. When the circulation is disturbed and dropsy appears, the use of digitalis is attended with good results, alone or with other diuretics, as in (40*a*).

ASTHMA

The symptoms of asthma are characteristic. The attacks, which may commence in early youth, occur at night. Both sexes suffer. On retiring to bed the patient is well and sleeps for two or three hours. On awakening there is dyspnœa; the breathing is difficult but not hurried, and is accompanied by great wheezing. The normal relations between inspiration and expiration are reversed; for the expiration lasts two or three times as long as the inspiration. The chest is expanded, the diaphragm unduly low, and the percussion note is markedly resonant. Auscultation is typically dry; hard, snoring, wheezing, and whistling sounds displacing each other in different parts of the chest, with disappearance and return at the point of auscultation. The extremities are cold, the face livid, and the expression pained and anxious. The pulse is small and quick, but there is no increase of temperature. The patient feels that if expectoration occurred freedom from dyspnœa would be secured, but in a case unaided by treatment this relief is only obtained at the end of the paroxysm, which may last from one to two hours, the accompanying expectoration consisting of frothy mucus containing Curschmann's spirals. Asthma is usually considered to be due to spasm of the bronchial muscles. Others hold that it arises from vascular engorgement of the mucous membrane lining the tubes.

Etiology.—The causes are direct and indirect. I. Direct. The exciting cause frequently acts directly on the pulmonary mucous membrane. Thus irritating inhalations and a damp condition of the atmosphere presumably operate. Errors of diet may possibly also act directly; thus a heavy supper may lead to distension of the stomach and pressure on the diaphragm; if so, those predisposed to asthma awake after the first sleep with the characteristic paroxysms. It is more likely, however, that dietetic excess operates indirectly. II. Indirect. The action may be through the *nervous system.* Thus may be explained attacks the result of strong emotion of joy or sorrow, fright, etc. etc. The so-called "dietetic effects" occurring after over-indulgence in food, especially taken late in the evening, may be explained by nervous agencies —afferent impulses travelling through the gastric branches of the vagus and being reflected at the medulla through its pulmonary offsets. Again, the action may be through the *medium of the blood.* This may account for the curious relations between diseases of the skin and asthma, though some prefer to consider this also due to nervous influences. *Heredity* is a powerful indirect cause, and may be traced in about one-half the cases met with. Sometimes asthma, instead of being idiopathic or spasmodic, is symptomatic of other chest affections, as chronic bronchitis, emphysema, heart disease, or nasal polypi. It may then be termed *symptomatic* or *organic.*

Prognosis.—Patients habitually asthmatic are thin and round-shouldered, and may enjoy fair health when they regulate carefully their diet, and do not expose themselves to unfavourable atmospheric conditions. Spasmodic asthma is not attended with danger to life, the patient suffering from this type of the disease being usually long-lived; but when asthma is organic, complicated with the other chest affections mentioned, the prognosis is grave.

Treatment.—The treatment to be adopted is based on efforts to relieve the paroxysm by promoting expectoration. The nitrites, naturally from their action on the blood-vessels, are suggestive of benefit; and it is found that the inhalation of nitrite of amyl is attended with satisfactory results,—a few minims being inhaled during fifty seconds give instantaneous but no permanent relief. A much more prolonged action is secured by the introduction of nitrites into the stomach, and in this way nitrite of amyl or nitrite of sodium may be given, or nitro-glycerin; and convenience of administration shows that of the remedies mentioned nitrite of sodium or nitroglycerin is to be preferred. They are both extremely stable, and can be readily given either in solution or by subcutaneous injection. For the introduction of the nitrites in the treatment of asthma we are indebted to Professor T. R. Fraser, Edinburgh.

All observers of asthma note, however, that it is advisable occasionally to change the treatment, and other remedies than those mentioned must not be overlooked, for their effects have been watched and favourably reported on by experienced men. Notable among these stands stramonium, the powder of which may be wrapped in cigarette form and smoked, or the powder may be combined with lobelia, nitrate of potassium, of each one ounce, and black tea, two ounces. Complete powdering of these ingredients is secured by half an hour's hard work with pestle and mortar. Half a teaspoonful of this should be placed on a plate and ignited. The fumes are inhaled by the patient, and frequently cause immediate relief by relaxation of the spasm and free expectoration.

Iodide of potassium in 5-grain doses thrice daily is a favourite drug, either alone or combined with tinct. scillæ

m. x., tinct. lobeliæ m. xv., liq. morphinæ hydrochlor. m. xii.; occasionally doses of the iodide, to the extent even of gr. xxx. to gr. xl., have been given with benefit. Not infrequently iodide of sodium acts better than iodide of potassium. Niemeyer favours quinine, if the seizures are regular and frequent; if irregular and at long intervals, he prefers metallic nervine remedies. Of these may be mentioned as specially entitled to confidence saccharated carbonate of iron, oxide of zinc, and arsenious acid; or in bad cases nitrate of silver.

In asthma with profuse expectoration (humid asthma) injections of pilocarpine have been highly recommended; and in asthma with disease of the heart a hypodermic injection of morphine alone or combined with atropine is useful.

The fact that asthmatics are frequently benefited by fog and murky conditions of the atmosphere, which aggravate other bronchial affections, suggests specially in this disease a change of air. Thus if the asthmatic patient usually lives in the town he may try the country, or *vice versa.* Personally I have seen asthmatic patients in Glasgow enjoy exceptional health during the fogs of frosty weather, while, on the other hand, when the winter was open and damp they suffered intensely.

Climatic Treatment.—Bournemouth and the Isle of Wight in this country are advisable as winter residences for asthmatics. On the Continent, Amelie-les-Bains, Axenstein, Lippspringe, Montreux, and St. Andreasberg. In America, Colorado Springs or Denver.

HAY ASTHMA or HAY FEVER.—This is a peculiar affection, distinguished by a catarrh of the eyes, nose, mouth, pharynx, and larynx, which varies in severity. It is observed more often in the town than the country, in a temperate than tropical climate, and chooses, according to the late Sir Andrew Clark, the "Anglo-Saxon before all other races." In the evolution of hay fever the same authority states there are three factors concerned—(1) The nervous constitution; (2) the irritable local state; (3) the outward exciting cause.

(1) The nervous constitution is sometimes inherited, sometimes acquired, but generally speaking hay fever appears to

come with civilisation, and to be more prevalent among highly cultured than ignorant people.

(2) The irritable local state involves the mucous, vascular, lymphatic, and cellular constituents of the parts affected, and when the irritability is excessive almost any local cause—as odours, dust, touch, light, heat—will serve as exciting agents.

(3) Undoubtedly the chief outward exciting cause is the inhalation of the pollen of various plants (chiefly of the gramin-aceæ) abundant during the hay season. But the fact that the disease occurs at other times than at the hay season, and that it is an affection more common in the town than in the country, induces the belief that local irritants, as mentioned previously, may prove exciting factors when there is irritability of the nasal mucous membrane.

Symptoms.—The first system is itching of the nose, hard palate and fauces, and eyes, which is followed by violent fits of sneezing and running from the eyes and nose. The sub-mucous tissue of the nares is affected, and the nostrils become blocked up, the discharge from them ceasing. Slight febricula is also present, the pulse being about 110. With the catarrhal symptoms there is sometimes considerable asthma, revealed by tightness of the chest, difficulty of breathing, wheezing, prolonged expiration, followed at the conclusion of the attack by expectoration.

As a rule the liability to the attacks lasts from three to four weeks in summer. There are no complications.

Diagnosis.—From cold in the head by its appearance generally in summer. From asthma by the catarrh which is usually unknown in ordinary asthma.

Treatment is local and constitutional. Of local remedies cocaine occupies a foremost place. It may be used in a solution applied to the interior of the nose, as a 5 to 15 per cent solution, with a laryngeal brush; or cocaine bougies may be inserted, containing each $\frac{1}{4}$ to 1 grain of the drug. Other local remedies are glycerinum acidi carbolici ℥i., quininæ sulphas ʒi., together with $\frac{1}{2000}$ of its weight of perchloride of mercury; or tannic acid in a solution of 4 grains to the ounce of water. The brush dipped in the solutions mentioned should be passed up the nostrils, then withdrawn, recharged and reapplied. Both nostrils should thus be treated. With the carbolic solution there follows sometimes considerable irritation, with swelling of the nose and increase of fever, and of this the patient should be informed. The length of the interval between the applications depends on the effect produced. Generally two or three are sufficient.

The constitutional treatment consists in a liberal diet, exercise, and attention to the functions of the bowels and skin, with a nervine tonic (F. 80). If circumstances admit of a change of residence, this should be advised, preferably to the seaside, where the prevailing winds are from the sea, not the land.

PNEUMONIA

Three forms of pneumonia are recognised: (1) ordinary acute pneumonia (*synonyms*, lobar, croupous); (2) bronchopneumonia (*synonyms*, lobular, catarrhal, disseminated); (3) chronic pneumonia (*synonyms*, interstitial pneumonia, cirrhosis of the lung).

Acute Pneumonia, acute inflammation of the substance of the lung, is best understood by detailing its clinical history.

Symptoms and Course.—The disease begins with symptoms of fever, preceded by shivering and accompanied by gastric disorders, sometimes assuming the form of jaundice. Then the breathing becomes accelerated, although not laborious, and there is a cough, this cough causing pain, which is referred to the chest, and, as a rule, to that particular part of it which is affected. After a varying interval, the cough, which at first was hard, becomes softer, and a tough tenacious sputum is expectorated. This sputum is considered, and justly considered, characteristic of the disease. It varies at the different stages of the disease. At the onset it is very scanty, of a whitish colour, and studded here and there with blood. Later on, and in some cases shortly after the initial chill, it assumes a *characteristic rusty tinge.* At this period it is viscid and clings to the side of the vessel into which it has been expectorated. Occasionally at this stage the sputum is not rusty, but grass-green. As the disease progresses the sputum becomes more abundant and thin, and its colour changes from brownish-red to a saffron or citron yellow. Fibrinous coagula are also observed, but as the disease tends towards recovery the fibrinous coagula disappear, and the colour of the sputum is similar to that observed in chronic bronchitis.

Micro-organisms.—Although several micro-organisms have been found in pneumonia it is now generally believed that the diplococcus pneumoniæ is the active agent in the production of the disease. This organism has been found in normal saliva, and in the exudative products of cases of bronchitis, pleurisy, lobular pneumonia, endocarditis, meningitis, etc. The bacillus pneumoniæ of Friedländer has also been found in a few cases. Other bacilli, occasionally associated with pneumonia, are the bacillus typhosus, bacillus diphtheria, and bacillus of influenza. Animals can be rendered immune against pneumonia by the injection of cultures of the pneumococcus, and the serum from convalescent pneumonic patients cures pneumonia in rabbits.

The temperature may reach 105° F.; or there may be typhoid symptoms, with debility, dry tongue, or delirium—so much so that the affection may be mistaken for typhus fever. The pulse is frequent, and hard at first. A herpetic eruption frequently appears on the lips or nostrils about the acme of the fever.[1]

Such are the general outward signs of pneumonia. What is going on inside? In answer to this it may be stated that the disease has been divided into three stages, which it is well to be familiar with, although it is absurd to suppose that they follow one another with mathematical precision. In the FIRST STAGE, if an opportunity was afforded of examining the organ attacked with inflammation, the characteristic appearance of the part involved would be redness, with a quantity of red frothy serum escaping on section. The elasticity and sponginess of the lung are diminished, but it will still float in water, for the vesicles contain fluid and air.

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[1] This herpetic eruption is, in my experience, always a favourable sign. Nurses term it the "breaking out of the cold."

In the SECOND STAGE the redness has yielded to solidification. The part affected has a thick heavy consistence. It no longer crepitates when pressed, and if thrown into water it sinks. Pressed between finger and thumb it breaks down, and from the appearance being like that of liver tissue it has been termed "red hepatisation." Here the fluid in the vesicles has coagulated.

In the THIRD STAGE resolution is taking place in the majority of cases, and the lung is coming back to its primary condition. When cut into, a great quantity of reddish or grayish fluid oozes out. Hence some call this "gray hepatisation." This stage may, however, be carried farther into diffuse suppuration, and sometimes, though rarely, into abscess and gangrene.

The change from the first to the second stage goes on rapidly, twenty-four hours or even less being sufficient. It must also be remembered that we may have one part of the lung in the first, another in the second, and another in the third stage, so that the auscultatory phenomena, which come now to be considered, will be found to vary at different sites. The accompanying engraving is intended to show the three different stages of pneumonia, while the upper part is unattacked by inflammation. On applying the stethoscope over an inflamed lung, the healthy vesicular sound may in part be heard, with the addition of minute crepitation during inspiration. What is this due to? Very probably it is formed in the minute spaces of the bronchial terminations and pulmonary vesicles; and by some is considered due to the bubbling of air through the liquid in the vesicles, and by others to the forcible separation of the walls of the vesicles glued together by exudation, and yielding to the inspired air; the sound is best realised by rubbing a lock of hair in the immediate vicinity of the ear or throwing salt on a fire.

In the second stage, over the part where the lung has become dense and solid, neither the vesicular murmurs nor the minute crepitation are heard, but there are other sounds

Pl. V.

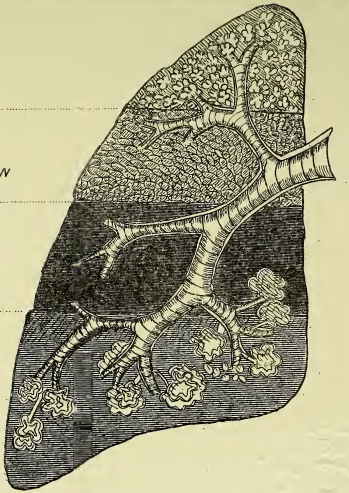
PNEUMONIA

Normal Lung

1ST_STAGE; ENGORGEMENT.
CREPITATION HEARD ON INSPIRATION

2ND_STAGE; COMPLETE DULNESS.
TUBULAR BREATHING.

3RD_STAGE; RESOLUTION.
CREPITATION HEARD ON
INSPIRATION AND EXPIRATION.



probably—viz. bronchial respiration or tubular breathing. This is due to the fact that there is entering the condensed mass a permeable bronchus, and the sound is conveyed along the solid conducting medium. So, also, there may be no bronchial respiration, and no breath-sounds at all heard, because the bronchi may be filled up with accumulated secretion. Sometimes this may be set free by a cough, and the bronchial respiration may be established. Ask the person to speak while the stethoscope is applied over the site of the solidified lung, and the voice-sounds will be conducted to the ear in an intensified manner, and hence the name "bronchophony." Similarly the vocal fremitus will be increased. On percussing the same part, it can also be easily understood how distinct dulness will be elicited.

In the third stage moist sounds are detected, for the lung is permitting the air again to enter. It is the first stage on a larger and coarser scale, because the crepitations are heard during both inspiration and expiration. It has been termed *crepitatio redux*, or more commonly *crepitus redux;* and it is usually a happy sign in pneumonia, since it indicates that the lung is returning to its duty, permitting the air to re-enter its wonted seat. It does not come on at once, neither does it invade the whole lung at once; and at last, as health is established, it is replaced by the healthy vesicular murmur, if resolution has been thoroughly progressing.

In pneumonia the right lung is more frequently attacked than the left, and the site of the inflammation is usually at the base; hence the back and not the front is the proper place for hearing the phenomena indicated. After continuing from five to nine days the temperature falls abruptly, forming what is known as the *crisis*, so characteristic in a large proportion of cases. The crisis may occur as early as the third day, or as late as the twelfth or fourteenth. Defervescence may take place by lysis, and in cases of delayed resolution the fever may continue for weeks. The urine during the stage of hepatisation shows a marked diminution or even absence of chlorides. These reappear as the inflammation subsides. It is commonly scanty, high-coloured, and tends to deposit urates. Pneumonia is sometimes double. If it is not, the healthy lung, requiring to act with increased force, renders the respiration "puerile."

Broncho-Pneumonia (Catarrhal Pneumonia).—This form of pneumonia is always associated with and generally preceded by inflammation of the bronchial tubes. It is most common in children, rarely seen in adults, and is frequently observed in old age. Attacking thus the extremes of age, it is a disease of great gravity, and statistics show that in children two-thirds of the cases end fatally, and when it occurs in old age the chance of recovery is not great unless the patient has had, previous to the illness, uninterrupted good health.

Without entering upon too minute divisions, we may say that broncho-pneumonia is generally a secondary affection, and if we consider it as this, we can understand what changes may occur in the lungs of those affected. We have inflammation of the smaller bronchi, and this may extend to the air-vesicles; or we may have obstruction of a bronchial tube, with collapse of the air-vesicles in connection with it. As the result of this congestion increased cell-formation takes place, going on to fatty degeneration, which changes the appearance from a reddish-gray to a yellowish colour. This fatty change may lead to resolution and absorption, but if this be not completed the masses break down and form a suitable nidus for the development of the tubercle bacillus. On section, therefore, of lungs in a recent case of broncho-pneumonia, it will be understood how the most prominent features are swelling of the lining membrane of the bronchial tubes, and congestion of the vesicles to which they lead. If the inflammatory process has extended to the vesicles, this will be manifested by small patches of consolidated reddish-gray ill-defined nodules studding the structure of the lungs and varying in size from a hemp seed to an egg. The interlobular divisions, however, remain distinct, and the consolidation thus limited presents a marked contrast to that observed in the ordinary form of lobar pneumonia.

Symptoms.—The pathological changes mentioned lead us to understand the characters of this disease. An increase of fever supervenes on a cold or bronchial catarrh from which a child has been suffering for a few days, the pulse becomes rapid, and the temperature may rise as high as 104°. The breathing is laboured, increasing to considerable dyspnœa, and the nostrils are generally dilated with each inspiration. There is much restlessness and occasionally convulsions. The sounds heard on auscultation are similar to those noticed in acute bronchitis when it attacks the smaller air-tubes (p. 166). Percussion indicates no dulness, unless centres of inflammation have coalesced, when areas of dulness may be here and there detected. The cough is hard and attended with no expectoration. Strength is rapidly lost, and in bad cases the inspirations become so feeble as to cause a condition approaching suffocation to set in. Before this serious symptom appears, the disease may be arrested and steady and complete recovery ensue, with, however, a tendency to relapses if due care be not taken.

When broncho-pneumonia appears in the course of hooping-cough or the infectious fevers, the fever is less severe, and the condition less intense. The course of the disease is, however, more prolonged, and recovery is slow. In broncho-pneumonia of the aged there is at times some expectoration, but its colour is not rusty as in lobar pueumonia.

Chronic Pneumonia (Interstitial Pneumonia, Cirrhosis of the Lung).—This form of lung disease may be either primary or secondary. The connective tissue of the lung becomes increased and hardened, and the calibre of the air-cells is diminished or replaced by the fibroid growth. When associated with chronic bronchitis, chronic pleurisy, or chronic phthisis, the connective tissue of the bronchial tubes, the pleura and the walls of the air-cells undergo much thickening. It is stated that when consecutive to acute pneumonia, the change begins by *organisation of the fibrinous exudation* in the air-cells. This has been termed "fibroid pneumonia." In other cases this variety seems to originate as a primary affection. The lung in cases of chronic pneumonia (excepting in the variety called fibroid pneumonia) contracts much, is solid and hard to the touch, is smooth in section and creaks under the knife. Irregular bronchial dilatations exist, and usually also cavities from limited necrosis of the tissues. The *symptoms* are—retraction of chest on affected side, dulness on percussion, tubular breathing with, in advanced cases, bubbling râles, and the heart's impulse shifted to the affected side.

General Prognosis.—Lobar pneumonia occurring in infants and in elderly people is always dangerous. An unfavourable prognosis must also be given when it is double, when the temperature remains above 104° F., when the pulse becomes weak, and when the patient has been addicted to drinking habits, and becomes delirious in the course of the disease. Although the pneumonia, *per se*, may terminate favourably, yet through its not resolving properly, or other circumstances, phthisis may supervene. In *broncho-pneumonia* the prognosis depends entirely on the circumstances attending the development; when it occurs with measles or hooping-cough, the prognosis is favourable. But with scarlatina and a temperature above 105° F. it is very unfavourable, especially if there are also a feeble pulse and a tendency to coma. In *chronic pneumonia* the prognosis as to time is good, as people with it may live for many years, and suffer only from dyspnœa. Any intercurrent affection will, however, have a direct influence on the prognosis of a disease which can scarcely be regarded as an independent affection.

Though it is admitted that pneumonia is intimately connected with a pneumococcus (it may be initiated by it), yet it is certain that no specific remedy has been found to control the inflammatory process which usually terminates by a crisis. The rational treatment of pneumonia is to keep in view the dangers connected with the disease, which are cardiac failure due to the fever, the toxic action of poisons produced by the disease, over-distension of the right chambers of the heart.

Treatment.—It is well to begin this by the administration of a mild saline cathartic alone, or preceded by 3 grains of calomel. When the action of the bowels has thus been effected attention should be directed to the prominent features of each case. If a plethoric patient suffers from *dyspnœa* or much pulmonary embarrassment and *lividity*, timely venesection may save life. To be of service it should be done early, not at a late stage of the disease as a forlorn hope. In the great majority of cases a symptomatic plan of treatment should be adopted to meet the indications as they arise. The *pain* in the side in severe cases is best relieved by the application of leeches, followed, after the bleeding has ceased, by hot linseed-meal poultices, which should be renewed every three or four hours. Their careful and continued use affords marked relief. They promote comfort and assist expectoration. If the case be less acute, leeches are unnecessary. Poultices sprinkled with the tincture of opium will be sufficient to overcome the pain. Cough is eased and expectoration *promoted* in the early stage by a simple combination of morphine, acetate of ammonium, vinum ipecacuanhæ, or vinum antimoniale (F. 73*a*). In a later stage a stimulant expectorant of carbonate of ammonium should be ordered (F. 44). The *temperature* should be carefully watched, and if it is above 104° the question of antipyretics should be considered. Phenacetin is the safest antipyretic. Five grains in the form of a lozenge, tasteless, and readily taken, should be given every three hours until the temperature is lowered one or two degrees. An ice-bag to the affected side is also an efficient antipyretic. If the high fever is combined with brain symptoms, the bath at 70° affords the best chance for life. It may be used without risk. In many cases sleeplessness may be met by sponging the patient and making him comfortable in bed. A glass of whisky often induces sleep. If drugs are required chlorobrom may be recommended as a safe hypnotic which does not depress the heart.

Progressive cardiac weakness is however the most important enemy to fight in pneumonia, for in this disease failure of the heart's action is one of the most frequent causes of death. The pulse should be carefully watched, and when it becomes small, frequent, or feeble, or very compressible, stimulants, preferably good well-matured whisky, should be given freely, and at short intervals, as a dessert-spoonful every hour or half-hour in milk and soda water. The amount required to be taken in the course of twenty-four hours may be from 6 to 12 oz. If the patient has been accustomed to the daily use of stimulants it is advisable to prescribe them from the beginning of the attack, and in every case when the patient's habits have been intemperate they should be given freely, for only by their administration can a fatal issue be avoided. For cyanosis many recommend inhalation of oxygen.

Of medicinal agents in cardiac failure, strychnine is certainly one of the most valuable. It may be given hypodermically in doses of from $\frac{1}{36}$ to $\frac{1}{20}$ of a grain. In such cases also I have seen much benefit from the use of musk. When there are signs of sudden or rapid heart failure, hypodermic injections of ether sometimes prove very serviceable.

Dietetics and Climate.—In severe cases of pneumonia the appetite from the beginning of the attack is lost, in less acute attacks this is also apparent though not so marked. Acting on the hint of nature, the diet should at first be non-stimulating and spare, and should consist of soups, milk, and eggs. When the disease has advanced to the second stage, it requires to be more nourishing, and chicken jelly or well-made beef-tea fulfils this object. At intervals pieces of raw meat cut up small and seasoned with salt and pepper should be ordered, unless there be a distinct aversion to this form of nutriment. Ice and iced drinks are grateful.

When consolidation has not entirely disappeared, it is advisable to order a change of climate, and for this purpose Ventnor, Falmouth, Cannes, or Mentone can be recommended.

In *Broncho-pneumonia* a uniform moist atmosphere of 62° by means of steam should be maintained in the bedroom, and linseed-meal poultices should be applied to the back and front of the chest. Castor oil should be given and a diaphoretic mixture as F. 31; to which, proportionate to the age, a few drops of ipecacuanha wine should be added. When the skin acts freely it is advisable to order a stimulating expectorant, as ammonia and senega, to dislodge the bronchial secretion. If exhaustion is extreme, brandy $\frac{1}{2}$ to 1 oz. in divided doses should be given to a child in twenty-four hours. If the fever be high and lividity marked, the child should be placed in a bath of 77° to 86° F., and cold water should be poured over the head and chest. Venesection to 3 oz. does good when the venous congestion is extreme.

Diet.— Milk and farinaceous food should be administered in small quantities at short intervals. In the treatment of *chronic pneumonia* remedies must be given for the relief of the different symptoms similar to those recommended in chronic bronchitis or phthisis (F. 43, 49, 52, 54).

GANGRENE OF THE LUNG.—This is one of the terminations of pneumonia, and occurs sometimes in phthisis. It may also be produced by pressure on the vessels, as in aneurysm or cancer at the root of the lung, or the presence of septic organisms. The *symptoms* as a rule are preceded by the symptoms of the disease to which gangrene is secondary, but in some cases they exist alone. The most prominent are fœtid expectoration and fœtid odour of the breath. The sputum is dirty gray, or greenish brown or black, and either contains fragments of gangrenous lung tissue, or the microscope detects the typical elastic fibres. The onset of gangrene may be soon followed by prostration, dry tongue, and death at no distant date. Some cases last for a long time, with symptoms varying in intensity before death occurs, and in a few cases recovery has taken place.

Treatment.—The patient's strength must be supported by nourishing foods and stimulants. The wearing of a zinc respirator, the sponge of which should be kept saturated by a disinfectant, as eucalyptol, terebene, or a solution of carbolic acid with camphor, is obviously serviceable.

PHTHISIS (*Pulmonary Tuberculosis, Consumption*)

Phthisis is the most common and fatal disease to which the human race is liable; it may occur in any country and may attack either sex at any age.

Etiology.—By whatever name it is called—predisposition, tendency, or taint—there can be little doubt that phthisis is *hereditary*. *Climate* also seems to influence it, for it is more common in temperate climates than it is in those where extreme heat or cold prevails; and various statistics evince that in temperate climates, in low and damp situations, it is more prevalent than where the soil is dry and the position elevated. Bad air, inefficient ventilation, poor food, and occupations where dust or solid irritating particles are inhaled, not infrequently produce it. It may also follow on measles, hooping-cough, syphilis, diabetes mellitus, continued fever, or other pulmonary affections. Premising that acute phthisis (galloping consumption) is rare, we will now proceed to speak of the general symptoms and physical signs of chronic phthisis.

General Symptoms.—The words "failing health" in their broad meaning seem to express the first leading features of phthisis. There is a sense of fatigue after exertion, such as walking quickly or in ascending stairs. The breathing is hurried, although no cough may be manifested. Subsequent to this, at varying intervals there is progressive emaciation and loss of flesh, proceeding in some cases with great rapidity. This thinness and weakness necessitates a careful examination with the thermometer morning and evening for not less than two or three days, and the exception is not to find in the evening an increase of temperature. The pulse also is quickened at the same time, and in some instances is affected by exertion, or by a change of position, as sitting down or standing up. The aspect of the patient is suggestive at this stage, for a bright eye and a flushed face go hand in hand with the wasting frame. Vomiting and diarrhœa may also attract attention.

The symptoms, which point peculiarly to the lungs, generally succeed to those mentioned, but as there is no rule without exception, cough may be the first indication of illness, arising, as popularly expressed, from a "neglected cold"; the patient notices that his throat has to be cleared in the morning, but little, if any, expectoration comes up. Afterwards this dry cough is accompanied by a clear sticky sputum, in which streaks of blood are present from time to time. When observed, they are of great diagnostic and practical importance, as they are sometimes the precursors of severe hæmoptysis, which by the laity is termed "vomiting of blood." This hæmorrhage may occur at all stages of phthisis, and an alarming hæmorrhage may be the first proof of the affection of the lung; and many cases are characterised by a special tendency to hæmorrhage, while in others it never occurs (see p. 9).

Tubercle Bacilli.—There are different methods for detecting the tubercle bacilli. We have found the solutions of Ziehl-Neelsen, modified by Gabbett, very satisfactory. The solutions required are:—

(A) *Neelsen's Solution.*—Saturated alcoholic Solution Fuchsine 10 parts; aqueous solution carbolic acid (5%) 100 parts.

(B) *Gabbett's Solution.*—Methylene blue 2 parts; sulphuric acid (25%) 100 parts.

Steps of the process:—

1. *Select suitable Sample.*—Collect in a clean vessel a sample of sputum coughed up in the morning. Place it on a black dish, pick out with forceps small portions of the yellow opaque flakes as being the most characteristic.
2. *Prepare Film on Slide.*—The particles selected are placed on a clean slide, about an inch from the end. The other end of the slide is then taken between the fingers and thumb of left hand. Another clean slide is similarly held in the right hand and pressed down on it, and then slid slowly off so as to give a uniform layer. By this means the portion of slide held is kept free for manipulative purposes. The slides are now allowed to dry in the air. The film must be as thin as possible. If uneven they may be slid over each other in the same manner after the thinner portions have dried.
3. *Fix Film.*—When dry the film is fixed by passing the slide three or four times through the flame of a spirit lamp, prepared side uppermost, and taking care not to burn the film.
4. *Stain in Solution.*—Some of solution (A) having been poured over the prepared surface and spread out, the slide is held by the free end horizontally over the flame of a spirit lamp until steam begins to arise.

5. *Wash in Water.*—It is then removed and allowed to remain five minutes ; afterward it is washed in water.
6. *Decolourise and Counter-Stain.*—Next the specimen is decolourised and counter-stained by treating it with solution (B) for half a minute.
7. *Wash again in Water.*—The slide is again washed in water. If any of the reddish colour remain in the general mass of the specimen, it is well to repeat this latter process, otherwise errors are likely to arise. (There is no fear of discolouring the bacilli by so doing.)

The specimen may be examined under the microscope in water, or dried and mounted in Canada Balsam, using, if necessary, either one large cover-glass or two smaller ones for each slide. The ground is stained blue, the bacilli red.

Dyspnœa is not a very marked symptom, but there is often pain in the shoulder, or beneath the clavicle ; and if there is not actual pain, there is a dull aching feeling at the sites mentioned. The pain when present is doubtless due to a direct extension of the tubercular process from the lung to the pleura.

Physical Signs.—We will now allude to the physical signs, which correspond in point of time with the general symptoms mentioned. These signs are due to progressive consolidation, which begins as a rule at the apex of the lung involved. If the physician stands behind the patient, who is undressed, with one hand placed lightly below the clavicles, he can detect the consolidation by the different and deficient expansion of the two sides. If he percusses the supra- and infra-clavicular spaces, and also the supra-scapular region, he may elicit a stroke of impaired resonance or actual dulness. On auscultation over the same parts he will find—(1) interrupted respiration at one apex, jerking or dry clicking ; (2) prolonged expiration of a harsh character. When the consolidation has become more marked and is tending to break down auscultation will reveal—(3) sub-crepitant moist sounds, or bronchial or tubular breathing. Apex catarrhs are as a rule tubercular, hence the significance of the signs mentioned. It must be remembered that the general symptoms and the physical signs must be considered together as bearing on the diagnosis of early phthisis. We cannot decide except by the totality of the facts in a case which has not a family history of tubercle.

Before proceeding further we may now briefly allude to the nature of tubercular change, and we may state that tubercular change usually begins in the walls of the smallest bronchi, generally in one or two circumscribed spots, and in the great majority of cases in one apex. The tubercular infiltration thus begun in the bronchial wall spreads gradually to the periphery, establishing tubercular peri-bronchitis, in which are noticed "cheesy nodules," which at first are gray, and later yellowish. The adjacent nodules run together; a little irregular excavation succeeds, which is the first beginning of the formation of a cavity. With the disease of the smaller bronchi the alveolar tissue of the lung is also affected, and partial lobular pneumonia results, which, from its tubercular character, becomes caseous. The alveolar walls are also diseased, and the destruction of the cheesy tissue results in the further formation of cavities, or in diffuse caseous pneumonia. Opposed to these destructive processes there is a tendency towards circumscribing the disease, thus limiting its growth and causing healing. New connective tissue forms round the tubercular infiltration, especially where there is already destruction of tissue, and this chronic interstitial process leads to contraction and the formation of a cicatrix. In chronic phthisis the conservative contractile changes evidence that the tubercular process may heal. This tendency to heal may, however, be baffled by the infectious material of the TUBERCLE BACILLI being carried into other bronchi. So new tuberculosis is set up, and the disease is constantly extended.

When the incipient or first stage is past, and the disease has proceeded unchecked, we have the following changes. Consolidation has broken down, excavation has ensued, and a cavity or cavities are formed. The layer of lung forming the wall of the cavity is in itself thick and solid, and this in many cases is aided by pleuritic adhesions. Hence on inspection we observe flattening of the apex or apices, and on percussion over this flattened spot or spots we find the sound is dull, or if there is a free communication with the open bronchi and the mouth, a *cracked-pot sound* is heard (*bruit de pot fêle*); on auscultation "gurgling" is detected by the air bubbling through liquid, or if the cavity be dry and hollow, "cavernous or amphoric respiration" is revealed. When the patient is asked to speak, "bronchophony" or well-marked "pectoriloquy" is heard. Frequently a murmur is detected below the clavicle on the left side, following the first sound of the heart, and this is presumed to be due to adhesion at the apex of the lung. The shrinking thus occasioned produces a bending and alteration of the subclavian artery, and the blood flowing through the narrowed channel gives rise to the murmur. The cough is frequent and irritable, and the expectoration consists of thick, yellow masses sinking in a kind of thin glairy liquid. Its pellet-shaped or coin-like character has led to its being designated as *nummular*. Later on its nummular character is lost, and it becomes distinctly purulent, sometimes having a green colour and most offensive odour.

Elastic Fibres from the Lung.—These may be seen under the microscope on teasing out the little tough nodules, which are sometimes found. But the best plan is to boil about an ounce of the sputum for twenty minutes with a solution of caustic soda, then allow it to settle in a conical glass, remove with a pipette, and examine under the microscope.

The general symptoms now markedly increase in severity. In the morning the temperature is normal, in the evening it rises to 103° or 104°. Profuse night sweats, diarrhœa, lack of appetite, and vomiting weaken the system. Some days or weeks before death, swelling of the feet and ankles supervenes, and death occurs from—(1) exhaustion; (2) excessive secretion and consequent suffocation; (3) pneumothorax; (4) hæmoptysis. The first mode is the most common.

Symptoms and Complications of other organs—Pleura.—The implication of the Pleura may result in pneumothorax (see p. 209).

Larynx and Trachea.—Although cases of primary laryngeal tuberculosis are known, yet in most cases the larynx and trachea are affected from pulmonary tuberculosis.

Intestinal canal—Peritoneum.—The tubercle bacilli rarely in phthisis infect the stomach, but in many cases they rest on and form ulcers in the vicinity of the ileo-cæcal valve, on the lower part of the ileum and the upper part of the large intestine. The peritoneum may be infected from tubercular intestinal ulcers, so that tubercular peritonitis is produced.

Liver and Spleen.—Fatty and amyloid liver may ensue in the course of phthisis, or amyloid disease of kidneys and spleen, or acute or chronic nephritis.

Further, at necropsies of phthisical cases both lungs are ultimately found more or less involved in the tubercular degeneration.

Duration and Prognosis.—Statistics vary as to the duration of phthisis; it may extend to two years or prove fatal in nine months. Pregnancy temporarily arrests its progress. The months of December and January are observed to be particularly fatal to phthisical patients. As indicated under Treatment, there is little room to doubt that sea-voyages and high altitudes in the EARLY stage are notably beneficial, and that a hopeful prognosis may in many cases be given.

We will now refer to two forms of phthisis which stand out distinctly from phthisis or pulmonary tuberculosis, viz. acute phthisis and fibroid phthisis.

ACUTE PHTHISIS (Pneumonic Phthisis).—This form, known also by the name of "galloping consumption," is met with in both children and adults. It is a rare disease, and in children seems dependent on tubercular degeneration following broncho-pneumonia, but in adults it may attack persons in good health who are overworked from any cause.

High fever, chills, night sweats, pain in the chest, cough, expectoration, rapidly increasing weakness and prostration are prominent symptoms. The physical signs show areas of impaired resonance usually at the apices; the breath-sounds are harsh and tubular with coarse mucous râles. The mischief extends rapidly, the lungs break down, the sputum is purulent and contains debris of lung tissue. The disease is often fatal in from five to twelve weeks, but occasionally partial recovery may take place, and the patient may linger on for a year or two with symptoms of chronic phthisis.

Fibroid Phthisis is a term introduced by the late Sir Andrew Clark to indicate cases of which fibrosis is the chief feature. There are two principal modes of origin of fibrosis: first, from attacks of pleurisy and pleuro-pneumonia, or of interstitial pneumonia; secondly, from chronic pneumonia, resulting from long-continued irritation of the lungs, through the inhalation of dust or dirt, such as prevails among fork- and knife-grinders, colliers, and button-makers. In the first form no tubercle bacilli can be detected in the sputum; in the second they can.

In the *first* form the history of the symptoms is as follows. There has been an attack of pleurisy with effusion, the effusion is absorbed, but percussion shows dulness over the whole side, and somewhat feeble respiration. A dry and hacking cough remains, with little expectoration, and the breathing becomes short after exertion. Then a few months later we find marked immobility of the affected side, with dulness throughout and considerable shrinking. This shrinking causes displacement of other organs. The stomach rises. If the left lung is affected, the heart is tilted outwards and remains uncovered. If the right lung is implicated, then the left may be drawn partly over the chest, and thus the area of resonance is abnormally increased. The impulse of the heart may be felt at the fourth interspace. The pulse is slow, and the temperature is rarely above the normal. The liver rises up to the fifth rib. The dyspnœa increases with the development of the disease, and the end is ushered in with signs of obstructed circulation, dropsy, and albuminous urine. The patient dies either from dyspnœa or blood-poisoning—symptoms rarely associated with death in cases of ordinary phthisis.

The necropsy reveals a lung contracted to the size of a man's fist, with thickened and adherent pleura, with widely-dilated bronchi, and with interlobular septa much increased in size. These septa encroach on the structure of the lung, which seems replaced by hard, fibrous tissue, deeply pigmented, mottled in parts with gray, and hard as cartilage in resistance to the knife. Caseous and cretaceous masses are found embedded in this structure, or sometimes excavations of various sizes. In the caseous masses but not in the fibrous tissue Watson Cheyne has found tubercle bacilli.

The symptoms in the *second* form resemble the first in the contraction of the lungs and shrinking of the chest wall, but the expectoration is more abundant and contains a number of tubercle bacilli.

We must remember that most cases of chronic phthisis have the elements of fibrosis present in them, and in most instances it is the limiting agent to the spread of tuberculosis, and therefore much to be desired.

Laryngeal phthisis (see p. 158).

Treatment.—The general treatment is indicated under tuberculosis. With regard to other remedies, cod-liver oil has deservedly been the sheet-anchor of the profession for many years. It affords the greatest amount of nourishment in the smallest form, and should be commenced in a teaspoonful dose at bedtime in lime water, lemon juice, or with 3 or 4 drops of chloroform, then the dose should be gradually increased, until an ounce or more be taken after food. It is not advisable to continue the oil in large doses for a longer period than four weeks. If this be done, digestive derangements arise and the appetite fails. The oil may also be rubbed in externally, especially if the stomach cannot digest it. Glycerin can sometimes be taken with advantage in dessert- or table-spoonful doses thrice daily, either alone or with the syrup of the iodide of iron in a bitter infusion. For children and young people butter eaten with bread is an excellent substitute for oil; they will increase in weight if it is given in large quantities daily, say from two to five ounces. Adults who cannot digest oil often improve on fresh cream, to which is added some salt, sugar, and rum. General tonic treatment with arsenic and strychnine is often useful. The hypophosphites, which can be given alone or in an emulsion combined with cod-liver oil, are very largely employed. Creosote obtained by distillation from the tar of the beech-tree contains 60 to 90 per cent of guaiacol, and creosote or guaiacol has been much used in phthisis. Their action is to reduce the extent of *the catarrhal* lesions, to diminish expectoration and to lessen its purulent character. They can be administered in capsules, which contain 1, 2, or 3 m.; from 5 to 20 of these capsules may be taken in the course of the day after food. I find that creosote can also be administered in a tasteless and less expensive way according to F. 81*a*. However taken, creosote or guaiacol in large doses often leads to digestive derangements. It is claimed for carbonate of guaiacol (a white, tasteless powder) that it has less irritating properties and that it can be used for a long period without affecting the digestion. It is, however, expensive. Painting the front of the chest with iodine is of considerable value.

In the early stages some preparation of opium, or better, codeine, which interferes less with the gastro-intestinal functions, is useful in allaying irritable cough. Towards the end, when the patient is being worn out by paroxysms of coughing, their use becomes imperative (F. 71). The treatment of hæmoptysis consists in rest in bed and abstention from speaking. The patient may suck ice. Any nourishment must be fluid. It may have to be administered per rectum. Of the so-called hæmostatic drugs only ergotine is of any use. Lead acetate, alum, turpentine, etc., are, however, much used. To control the diarrhœa, chlorodyne is useful; and to check excessive *night* sweats the following remedies are used—the hypodermic injection of $\frac{1}{100}$ grain of atropine; agaricin $\frac{1}{13}$ grain in pill; camphoric acid 30 grains in powder. The following treatment has been recommended in *acute phthisis.* Careful nourishment, stimulants in small quantities at regulated and repeated intervals, the subcutaneous injection every night of $\frac{1}{100}$ of a grain of atropine, with antipyretic remedies in the form of iced cloths to the abdomen, 10 to 30 grains of quinine in one dose daily, or one grain of quinine combined with half a grain of digitalis and a fourth of a grain of opium, as in "Niemeyer's pill."

Prophylactic, Climatic, and Dietetic Treatment.—It is of the utmost importance to strengthen in early youth the system of those who have the hereditary predisposition to phthisis. Among many factors for good may be mentioned cold sponging and cold baths to harden the constitution against the influences of changes of the weather. If circumstances permit, young people from the ages of ten to fourteen years, whose parents were or are phthisical, should breathe during winter the pure air of a high altitude. The lungs are thus expanded, and the epoch of puberty may be passed in safety. If symptoms of phthisis are seen in a person engaged in an occupation which is injurious to the respiratory system, such an occupation must be given up. Thus workshops or factories where dust is inhaled, or offices badly ventilated, are recognised to have a very serious effect in evoking tubercular change, and those employed in such places, whose health has commenced to give way, should change their occupation and if possible obtain work where they would be much out of doors. The diet in phthisis should be nutritious. The attendant wasting must be met by taking hydrocarbons, fat meat, cream, eggs, butter, and farinaceous food. Experience testifies that alcoholic stimulants or wine are specially useful, and the ease with which phthisical patients can take large quantities of these without harm is a distinct proof of the system requiring such support. A general rule with regard to stimulants in phthisis can hardly be formulated, yet the following statements bear pertinently on the questions involved in sanctioning their use. If the immediate result is a sense of vigour and comfort, if lassitude is removed, if there is a greater disposition for exercise, if there is no excitement of the circulation or of the nervous system, then *stimulants do good.* If, on the contrary, stimulants excite the circulation and the nervous system, if after taking them there is a feeling of weakness and a desire to rest or sleep, *then they do harm.* The form selected should in the main be left to the patient's taste. Yet the remedial principle in stimulants is alcohol. Preferences for and experimental trials with wines, spirits, ale, or porter, must decide in individual cases. *As a rule, with any form of stimulant, food should be taken.* Malt extracts, so much lauded, have little nutritive value. They are no substitutes for alcohol.

The appetite should often be tempted with dainty and nourishing food, but not so often as to cloy the desire to eat.

For delicate patients, especially ladies who are unable to take exercise, and who suffer from fever and hæmoptysis, the climatic health resorts of Algiers, Madeira, or the Canary Islands are most suitable during winter. In incipient cases, especially of males, a timely sea-voyage is of inestimable advantage. "Of all the remedies for phthisis," says Sydenham, "long and continued journeys on horseback bear the bell. Bark is no surer cure for ague than riding is for phthisis." When patients have no hæmoptysis, no great fever, and no laryngeal symptoms, Davos Platz, with its keen pure air, can be specially recommended in winter, and in *summer* a change may be made to Meran; or Badenweiler and Rippoldsau in the Black Forest; or to a high altitude at Aussee, St. Moritz, Seelisberg, or Pontresina; or to a place impregnated with the odour of pines, as Bournemouth; or to stations where whey and milk cures in mountain air form means of treatment, as Gais and Herculesbad.

For those who elect to make a permanent home in another country, the State of Colorado presents means of cure and prospects of employment afterwards, which none of the other places mentioned possess. The altitude of Denver, Pueblo, and Colorado Springs in the State of Colorado is high, and a man whose health has been restored may in any of them live and work and do well.

PLEURISY

Pleurisy was the designation given at one time to every pain connected with the chest, but now it is exclusively applied to inflammation of the serous membrane lining the walls of the thorax and investing the lungs. It may thus be either single or double, according as one side or both sides of the chest are affected. It may also be either acute or chronic.

Symptoms.—In acute pleurisy the attack is generally sudden, and sometimes accompanied by a rigor, while at the same moment the leading and characteristic feature of the affection is manifested—viz. an acute and lancinating pain, called a stitch, and generally referred to the region of the mamma. The respiration is short and hurried, and is usually performed with most difficulty when the patient lies on the affected side. A short, hard, dry cough is almost always present, and as this cough aggravates the pain the patient attempts as much as possible to stifle it. The temperature rises to 101° or 102°, and the pulse is frequent, full, and hard. The tongue is coated with fur, and the urine is scanty.

Such are the external features of acute pleurisy in the early stage, and if the stethoscope is applied near to the seat of the pain the auscultator detects a *friction sound* or "rub," which is due to the opposed pleural membranes grating upon one another, and this friction can often also be felt on palpation. If we could see the pleural surfaces at this time we would observe a thin layer of lymph of a soft whitish consistence lining the membranes. If the inflammation is cut short, this lymph is absorbed, and the investing membranes glide over one another as in health. Consequently the friction sound disappears.

But should this not occur, an effusion of serous fluid takes place into the cavity, and the external features and the auscultatory signs undergo a change. The affected side shows distension, the intercostal spaces are bulged out, and the lung is pressed back against the vertebral column. The air is squeezed out of it, and as the effusion increases it becomes less and less fit for its function. The breathing is difficult, and is aggravated by lying on the sound side. Percussion now shows dulness of a resistant, wooden quality corresponding to the extent of the effusion, and this dulness may be complete or partial according as the fluid fills the whole or only part of the pleura. When the patient sits up, the fluid, unless bound by adhesions, changes its position and gravitates to the most dependent part. The alteration of the level of dulness occasioned in this way is not great, amounting only to a finger-breadth or two. In the subclavicular region, the attention is often aroused at once by a tympanitic note, Skoda's resonance, which shades insensibly into a flat note in the lower mammary and axillary regions. Skoda's resonance may be obtained also behind, just above the limit of effusion. There is also a loss of vocal fremitus. Auscultation reveals no breath-sounds over the usual sites, but if we listen at the back where the compressed lung rests, we may, if the pressure is not complete, detect bronchial breathing, which is like that of pneumonia, yet differing in being softer to the ear or more distant. The resonance of the voice through the chest is altered; it becomes shrill and tremulous, and from its supposed resemblance to the bleating of a goat, Laennec termed it *Ægophony*. It occasionally appears and disappears. The particular region for hearing this sound is at the inferior angle of the scapula and round to the axilla. Moreover, if the effusion is great there may be considerable displacement of organs. Thus if on the right side, the diaphragm may be depressed and the liver displaced downwards. In extreme cases affecting the left side the heart may be seen beating on the opposite side of the chest. In single pleurisy the inaction of the affected lung throws increased work on the sound one, and the inspirations are correspondingly strong. They lose the natural soft vesicular character of adult health, and become loud and pronounced like that of a boy—hence the term *puerile breathing*. Mensuration will also show an increase of the affected side as compared with the sound one.

Course and Event.—The effusion may never become purulent, but may be absorbed, as evidenced by a gradual diminution of the dulness; and if no adhesions exist, the lung regains its natural size and resumes its natural functions. But if there are adhesions it cannot proportionately expand, and although fair health may be maintained, the affected side shrinks in comparison with the sound one. The course of pleurisy may, however, be changed, and for the worse—the fluid becomes purulent, hectic fever develops, and often violent shivering fits recur at irregular hours, and the expectoration is sometimes offensive to the smell and purulent in character. This termination of pleurisy is termed EMPYEMA. Sometimes without empyema and without any great absorption of the effused fluid, the disease passes on to a chronic stage, *chronic pleurisy*, the symptoms and signs of which are described at p. 208.

Empyema.—The course of empyema is varied. Sometimes the pus escapes through the lung into the bronchial tubes, giving rise to the purulent expectoration previously referred to, and if the opening leads directly into the bronchial tubes, air passes into the pleural cavity, to take the place of the liquid, and the condition "Pyopneumothorax" results. But in many cases no such result follows. Traube's explanation of this is that if the pleura alone is eaten through, the alveolar texture of the compressed lung may allow pus to be forced through it by violent coughing, while it yet fails to afford a passage to air in the opposite direction, especially as there is little or no movement on that side of the chest during inspiration.

In other cases the empyema points at an intercostal space, and in course of time an external opening is made, generally below the nipple, and the imprisoned pus escapes in large quantities. Sometimes in empyema the diaphragm may be perforated, and occasionally pus makes its way backwards from the pleural space behind the diaphragm and points at the loin or popliteal space. Unless the pus escapes through the pulmonary tissue the spontaneous discharge of an empyema is attended by a long and trying illness, with great emaciation and exhaustion, which very often leads to the death of the patient. The only hope of recovery is the obliteration of the whole cavity by the formation of granulation tissue, and by the contraction of the fibrous material developed from it. Then the ribs fall in, and the dorsal spine becomes curved, with a concavity toward the affected side. The shoulder also shrinks, the diaphragm is moved upwards with the abdominal viscera, and there is such misplacement of the heart that its impulse can be seen and felt over an extensive and abnormal area.

Duration.—The duration of an ordinary attack of acute pleurisy varies; sometimes amounting to five or six days, sometimes to as many weeks.

Varieties.—Usually pleurisy is single, but the disease, although primarily affecting one side, may spread to the other, constituting Double Pleurisy. Sometimes the pleurisy is *dry*, with no exudation; sometimes it is *latent*, with little fever, little pain, no dyspnœa, and yet an extensive pleuritic effusion; sometimes it is *diaphragmatic*, with pain in the hypochondriac region reflected to the clavicles, great dyspnœa, breathing markedly thoracic in type, cough, intense fever, and vomiting. Pleurisy is very frequently associated with phthisis. In all chronic phthisical conditions pleurisy, leading to adhesions and obliteration of the pleural cavity, is present. Acute pleurisy with effusion may occur at a very early stage of phthisis, and may even seem to precede it. The pleurisy here is due to caseous necrosis of a portion of the lung immediately under the pleura, allowing the pleura to become infected before adhesions have formed. Recovery from pleurisy is always to be carefully watched, and the precautions against cold sedulously enforced.

Diagnosis.—*Pneumonia* and *pleurisy* have certain things in common—viz. pain in the side, fever, dyspnœa, cough, and dulness on percussion; yet a careful physical examination shows distinctive features in these signs. Favouring pleurisy are—(1) a marked distension of the affected side; (2) dulness more complete; (3) diminished or suppressed respiratory murmur; (4) vocal fremitus absent or diminished; absence of rusty sputum, herpes on the lips, or fine crepitation. To tell whether the fluid is still serous or has degenerated into pus (empyema) is a point of great practical importance in regard to treatment; a serous effusion may be absorbed, but, if purulent, absorption is out of the question. We may learn much from the history and the symptoms of the case, for long continuance of the disease, shiverings, hectic fever, night sweats, rapid emaciation, indicate empyema. The only certain information is, however, afforded by an exploratory puncture with a hypodermic syringe and a careful inspection of the fluid withdrawn. The syringe may be of the same size as an ordinary hypodermic one, but the needle should be of larger bore, stronger and at least 1½ inch in length. *Intercostal neuralgia* may simulate the first stage of pleurisy, but it is distinguished from it by the pain not being aggravated by breathing, and by the absence of friction sound and fever. *Cancer of the lung* presents physical signs closely resembling those of a pleural effusion. It does not, however, cause enlargement of the affected side, and it is also a disease so rare as practically to be left out of account, unless the history and the cancerous cachexia, and the probably "red currant jelly expectoration," point to its occurrence.

After the foregoing remarks the PATHOLOGY of pleurisy may be shortly stated thus:—

1. Some redness and swelling of the pleural surfaces, and with no effusion.

2. Exudation partly serous and partly fibrinous, the fibrin being deposited on the inflamed surfaces; and as inflammation goes on this fibrin is replaced from beneath by an inflammatory growth comparable to granulation tissue.

3. The fluid may be absorbed, and thus the two granulating surfaces coalesce, obliterating the cavity.

4. The fluid may increase and become purulent.

Treatment.—In the very earliest stage of pleurisy, there can be little doubt that the application of a large fly blister to the chest wall relieves pain and prevents effusion. But if the case be not seen until some hours have elapsed it is not advisable to apply a blister, for the action then may not be so beneficial and the vesication produced prevents the use of other applications.

The most prominent symptom now is pain, and the most satisfactory way of relieving this is by the hypodermic injection of morphine, 3 minims over its seat, and the application of hot linseed-meal poultices. The first poultice should contain half its weight of mustard, but the subsequent ones should be made entirely of linseed meal. Dr. F. T. Roberts strongly advocates another method for relief of pain by careful strapping of the affected side with long strips of adhesive plaster drawn tightly and evenly, which should pass well over the middle line. Three grains of calomel or a saline draught should be administered, and after the action of the bowels has been obtained, small and repeated doses of opium should be given to check the inflammatory process. It may be given alone in the form of tinctura opii, 8 minims in water every hour or two hours, or with 30 minims of liquor ammonii acetatis and spiritus ætheris nitrosi. This local and internal treatment often succeeds in preventing any effusion, or at all events in making it small and easily absorbed.

But if the case be seen when effusion has occurred to a greater or less degree, then the pain is not severe and does not require external or internal means for its relief. The object now is to promote absorption. Small blisters about 3 inches long and 2½ inches broad should be placed on different parts of the affected side at the same time; after the blisters have healed, liq. iodi fort. should be applied. Internally, if the patient's health had been robust previous to the attack, Guy's pill (F. 36) given thrice daily for three or four days does good service; afterwards a mixture of digitalis, squills, iodide of potassium (F. 36*a*). If, owing to the patient's previous health, this treatment does not seem advisable, then salicylate of sodium is a good remedy. There is increasing testimony as to its efficacy in dry pleurisy, and of its favourable action in secondary pleurisy. It appears to act as a diuretic, but it may even have an effect on the pathological process of the disease in its early stage. 60 to 90 grains may be given in the course of the day, and the amount may be lessened by one-third or one-half when its diuretic action is manifest. The total quantity of urine should be measured daily. Mention may also be made of Hay's method. This consists in a dry diet, and in giving every morning, an hour before breakfast, from ½ ounce to 1½ ounce of sulphate of magnesium dissolved in the smallest quantity of hot water. This produces copious liquid discharges, and cases have been recorded where the adoption of this treatment was succeeded by the disappearance of large exudations.

In many instances the actual removal of the fluid by puncture becomes desirable. There are three cases in which it should be done: (1) When the effusion fills the whole of one side of the chest; (2) when the liquid, though not so abundant, has been present some weeks, and in spite of treatment shows no indication of being absorbed; (3) when hectic symptoms indicate that the liquid is purulent. It does not appear to be advisable to resort to puncture in pleurisy with serous effusion until the end of the third week, but rather to rely patiently on the means indicated for promoting absorption. In a doubtful case before removing the fluid it is well to make an exploratory puncture.

If the diagnosis of serous fluid be made certain, then the *aspirator* should be used. There are different forms, but it consists essentially of a pump by which the air is exhausted as completely as possible from a bottle or receiver to which the tube with the aspirator is attached. The communication between the tube and the bottle having been shut off by means of a stop-cock, the needle is then introduced into the chest. The stop-cock is now turned on and the fluid flows into the bottle, but the flow can be made more expeditious by slowly using the pump attached to the bottle.

It is questionable if all the fluid should be removed at once, as if this be done distressing cough and dyspnœa may follow. The withdrawal of the fluid should be stopped when the patient complains of any pain in the side or commences to cough; this shows the pleural surfaces are coming into contact, and the needle should be withdrawn. After withdrawal, a small piece of lint soaked in a 5 per cent solution of carbolic acid should be placed on the site of the puncture and fastened by a few strips of adhesive plaster.

The *site* chosen for puncture is usually between the seventh and eighth spaces in the posterior axillary line, but when there is not much liquid it may require a puncture in the ninth space, near the angles of the ribs. To prevent pain, a piece of ice should be applied for a short time or ether should be sprayed over the spot selected. The operation should be made under strict antiseptic precautions, and the needle should be made scrupulously clean and aseptic. It is well also to see that the aspirator is working properly by carefully testing it with water. The *patient* should assume a semirecumbent position: the arm of the affected side should be brought forward, until the hand rests on the opposite shoulder, in order that the interspaces may be widened.

If pus, not serous fluid, is revealed by the exploratory puncture, treatment by aspiration should not be trusted to, for the pus will certainly collect again. It is fundamentally wrong to leave pus in the pleural cavity. The best method of treatment then is to make, with the usual antiseptic precautions, as regards the skin, the instrument, and the hands of the operator, a free incision into the seventh or eighth space, to insert a large indiarubber tube into the aperture, and allow the pus to drain into antiseptic dressings. In some cases the cavity continues to secrete pus, and the wound does not close. Further procedure is now necessary, for the weakness attendant on constant discharge of pus may bring on other affections, as amyloid disease of the kidney or liver. Another effort is made to obtain a free exit of matter by removing a portion of a rib or ribs adjacent to the wound. The details of this operation fall to the province of surgery. The after-treatment of empyema consists in supporting the patient in every way by good food, cod-liver oil, tonics, stimulants, and if possible by a residence at the sea-coast.

Chronic Pleurisy.—As in simple pleurisy, the pleura is full of fluid to a greater or less degree, but this fluid is milky or purulent, and often coexists with a pulmonary fistula. If the pleurisy be double, it is frequently associated with tubercle.

Symptoms.—As in acute pleurisy after exudation, there is absence of thoracic vibration, with complete dulness, and loss of the respiratory murmur. The side affected remains immovable, the intercostal spaces are filled up, while any other position than lying on the back, or the side affected, is impossible. When chronic pleurisy is primitive, *i.e.* does not follow on an acute affection, it does not announce itself by any local pain; the fever, if any, is irregular, with little or no dyspnœa. In fact the pleural cavity may sometimes be full of fluid without the patient being conscious of this. After this mode of invasion, tuberculosis is apt to set in with weakness and enfeebled digestion, followed by hectic fever and night sweats.

Treatment should be tonic—cod-liver oil, syrup of the iodide of iron, and good nourishing soup and beef-tea.

Should there be no indication of tuberculosis or cancer, should the effusion seriously endanger the patient's life by suffocation, and should it fail to be removed by the means mentioned, or by absorbent or diuretic treatment (F. 35, 36, 37), it is advisable to perform paracentesis.

Pneumothorax.—This condition may result from injuries —as broken ribs or falls or strains, or from hooping-cough, pleurisy, or emphysema—but in the great majority of cases it is associated with phthisis. In the process of tubercular ulceration and by the force of coughing an opening is made into the pleural cavity, and subsequently at each successive inspiration air enters, and pneumothorax is established. The external signs show that the intercostal spaces on one side are distended, and that there is in most instances lateral displacement of the heart. By percussion the sound elicited, as a rule, is hyper-resonant, clear, and hollow. Yet not always so, for if the air should accumulate so as to cause increased distension, it may make the pleural cavity tight as a distended drum, with all escape of air from its cavity prevented, and then the percussion note is "muffled, toneless, almost dull." Within a few days pus is formed, and the condition known as pyopneumothorax is established, the signs of which are very characteristic. When the ear is applied to the chest no respiratory murmur is heard, but in its stead a sound is detected which is like that of a pin falling into a metal cup, and hence the name *metallic tinkling.* This is a liquid sound, produced by the bursting of bubbles in a large space, which is filled with air and has a smooth surface. As Laennec showed, this sound may be occasioned by the dropping of liquid from the upper into the lower part of the pleural space, when it contains air as well as pus. So also coughing and drawing in the breath may initiate it, and in some way not very well understood, speaking intensifies the sound. When the patient's body is shaken a "succussion splash" is produced, and as this was known to Hippocrates, it is sometimes alluded to as "Hippocratic succussion." In all cases of pneumothorax a *metallic echo* can be elicited in the following manner: The physician applies his ear to the chest, while an assistant uses two coins, one as a hammer, the other applied as a pleximeter to the chest; the result is that a sound is borne to the listener's ear clear and ringing, and not unlike the chime of a small clock—hence the name the *bell sound*.

In cases of injuries or strains the general symptoms of pneumothorax are marked by the distinct sensation of something giving way in the chest, with sudden pain, great dyspnœa, faintness, intense anxiety; afterwards the lips become blue and swollen. But in cases of pneumothorax in phthisis the symptoms are masked by the recumbent position of the patient, and the external signs are alone manifested. In most cases pneumothorax proves fatal in the course of a few days, although this issue may be delayed by paracentesis.

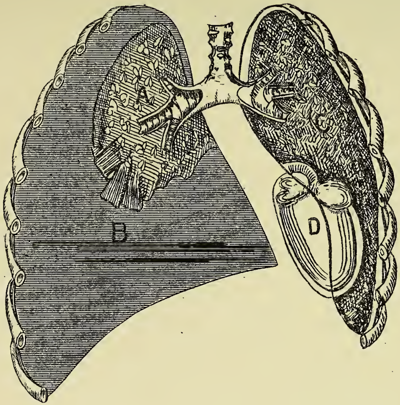
HYDROTHORAX.—The occurrence of a serous transudation into the pleural cavity, independent of an inflammation of the pleura, is termed hydrothorax or thoracic dropsy. It is usually bilateral, and in the great majority of cases is part of a general dropsy, especially in emphysema and in cardiac or renal disease. The absence of adhesions, the frequent and very loud respiratory murmur, the more marked change in the boundary line of the dulness, distinguish hydrothorax from an ordinary pleuritic effusion dependent on inflammation.

DISEASES OF THE CIRCULATORY SYSTEM

THE PULSE.—The pulse is felt best wherever an artery lies near the surface, and can be pressed against a bone beneath it, and for practical purposes the radial artery at the wrist is almost always chosen.

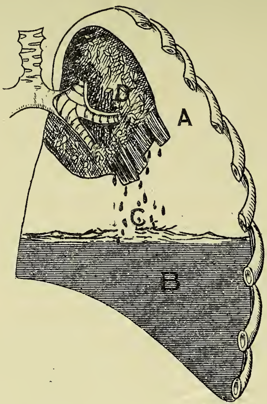
In the examination of the pulse, the first three fingers are laid lightly on the artery, and its characters noted as to

PLEURITIC EFFUSION.



A.—VOCAL RESONANCE INCREASED ABOVE (BRONCHOPHONY):
DIMINISHED COMPARATIVELY BELOW (ÆGOPHONY):
B.—VESICULAR BREATHING ABSENT.
C.—PUERILE BREATHING.
D.—HEART DISPLACED.

PNEUMOTHORAX
WITH EFFUSION.



A.—PERCUSSION TYMPANITIC ABOVE. DULL BELOW. (B.)
C.—METALLIC TINKLING. SPLASHING ON SUCCUSSION.
D.—AMPHORIC BREATHING HEARD OCCASIONALLY.

frequency, size, uniformity, and strength. Certain abnormalities betoken disease.

1. *Excessive Rapidity.*—The normal rate of the pulse in an adult is about seventy-two beats per minute, but certain states, such as excitement, exercise, the partaking of food, or the sudden assumption of the upright positon, may cause this standard to vary without the health being impaired. With many pathological conditions the pulse is quickened, *e.g.* fever, anæmia, chlorosis, cardiac failure from any cause, Graves' disease, nervous disorders as in locomotor ataxy. Other signs in these cases indicate, in addition to the condition of the pulse, the nature of the disease present, but in some cases the rapidity of the pulse is almost the only reliable diagnostic symptom observed, *e.g.* in certain gouty states, or when there is much mental worry. When there is some disorder of the nervous mechanism of the heart the pulse rate may be greatly increased.

2. *Slow Pulse.*—This may not indicate in some persons any departure from health, but it is usually associated with diseased conditions, as jaundice, fatty degeneration of the heart, and some forms of epilepsy.

3. *Intermittent and Irregular Pulse.*—The pulse may vary in its rhythm in relation to the action of the heart or independently of this, and further this variation may be regular or irregular in its occurrence. Nervous excitement, abuse of tea or tobacco, notably cause for a time a quick and irregular pulse without any cardiac. lesion. A truly irregular pulse is one in which the rhythm and force of the pulse-beats vary irregularly, and this is especially associated with cardiac failure and mitral valvular (most often obstructive) disease.

4. *High-Tension Pulse.*—A normal pulse is, as a rule, easily compressible, and between the beats the artery can hardly be felt, but increase of the peripheral resistance, together with a corresponding increase in the force of the ventricular systole, produces the high-tension pulse. The characters of this are, its impulse is gradual, its duration long, its subsidence slow, and the artery is felt between the beats as a firm round but compressible cord. If, with the peripheral resistance still continuing, the heart power should fail, the pulse of high tension

becomes one of "virtual tension." As a rule, a high-tension pulse indicates an impure state of the blood, which renders it incapable of passing easily through the capillaries on account of a degree of spasm in the arterioles, and which is produced by abuse of nitrogenous food, constant alcoholic excess, and deficient exercise. It is also especially found in association with kidney disease, lead poisoning, and pregnancy.

The pulse of "virtual tension" is most often found in the late stages of Bright's disease.

5. *Low-Tension Pulse.*—The artery is scarcely to be felt between the beats, and the pulse is easily obliterated by pressure, hence the arterial tension is sudden in its onset, short in duration, and quickly declines.

When the arterial tension is very low the dicrotic pulse is observed. The meaning of the term is that on applying the fingers very lightly to the artery a second impulse can be detected following the first.

6. *Senile Pulse.*—This pulse occurs in elderly or prematurely old people, and may be considered as indicative of an atheromatous condition of the vessel. It may be recognised by the fact that although an amount of firm pressure quite sufficient to completely obliterate the pulsations be applied to the vessel, the feeling of a *cord* still persists under the finger. In many instances this condition may be recognised by the eye, and often the vessel may be seen to be tortuous.

7. *Corrigan's Pulse* is a special form of pulse which is associated with aortic regurgitation. Its impulse is sudden, large, and of short duration. Its fall is abrupt, and between the beats it can hardly be felt (see p. 226). It depends upon the ventricular dilatation and hypertrophy which accompany this form of heart disease, propelling the blood with full force, which, however, is not permanent, for immediately after the systole is over the artery is no longer kept extended, but collapses, and this is greatly due to the backflow of blood into the ventricle through the non-closure of the aortic orifice.

Capillary Pulsation is especially noted in aortic regurgitation. If the skin over the forehead be rubbed in this disease, the capillary vessels will be seen to pulsate distinctly with each beat of the heart.

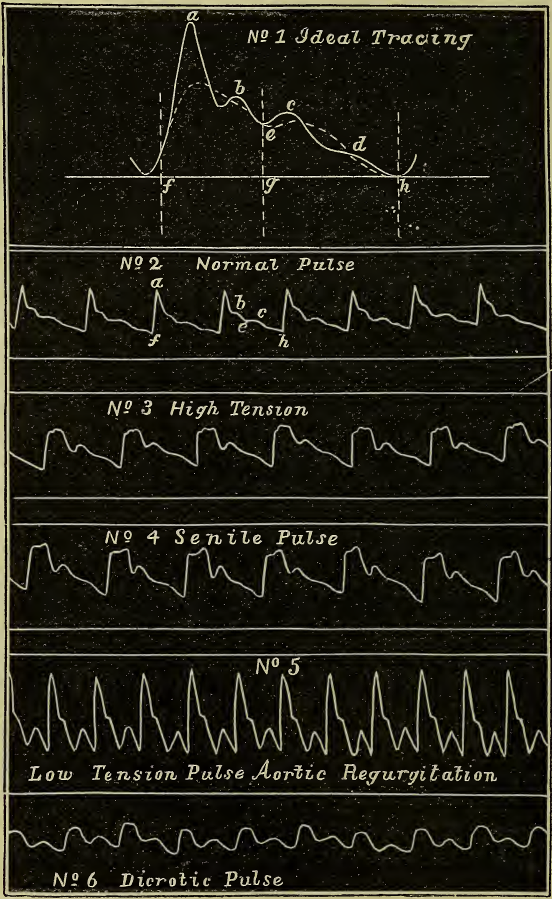
8. *Venous Pulse.*—It has been shown by Dr. Broadbent that in the same conditions the pulsation may be communicated even to the veins, and can be seen in the veins of the wrist when the hand hangs down. Pulsation also occurs in the veins of the neck in tricuspid regurgitation. The systolic shock of the right ventricle is communicated to the contents of the right auricle, and through them to the superior vena cava and its radicles.

9. *Aneurysmal Pulse.*—In thoracic aneurysm the interposition of the aneurysm constitutes an elastic reservoir between the heart and the radial artery, and modifies the condition of the radial pulse. The artery remains full between the beats, and the pulse is small. The impulse is not sudden. It lasts long, and it subsides in a gradual manner. If from the position of the aneurysm only one radial pulse be affected, a comparison of the pulse in it with the one unaffected brings these points out in a marked manner. A sphygmographic tracing shows a low and gradual ascent, a rounded summit, a gradual descent, and almost entire obliteration of the secondary waves.

The Sphygmograph.—The sphygmograph consists essentially of a slender lever, which is moved by the pulsations of an artery. The end of the lever rests on a strip of smoked paper. When the paper is put in motion by means of a mechanical contrivance, the movements of the artery conveyed through the lever are traced on it. The two varieties of sphygmograph commonly in use are Marey's and Dudgeon's. Reliable results can only be obtained by experience and practice. The instruments are so constructed that a definite and known amount of pressure may be exerted on the underlying artery.

An *ideal tracing* (see Fig. 9) consists of the following parts:—(1) A *primary* or *percussion* wave, *a;* (2) a *secondary* or *tidal* wave, *b;* (3) a *dicrotic* wave, *c;* (4) a *fourth* wave, *d;* and (5) the aortic notch, *e*. The duration of the cardiac systole extends from *f* to *g*, and the duration of the cardiac diastole from *g* to *h*. The line *fh* is called the *basal* line. The dotted line represents the tracing which would be drawn if the instrument followed the movement of the artery with perfect accuracy (Galabin).

The *percussion wave* will thus depend on the completeness and fulness of the systole: a flaccid condition of the vessels will amplify it, and a state of tension reduce it. The presence of the *tidal wave* depends mainly on the duration of



The tracing in Figure No. 1 is on a different scale from those following.

Fig. 9.

arterial tension due to the cardiac systole. If the tension is not maintained the percussion wave falls quickly till it is raised by the dicrotic notch.

Thus the *high-tension* pulse tracing (Fig. 9, No. 3) shows a broad apex. If a straight line drawn from the apex of the percussion stroke to the aortic notch *places the tidal wave much outside and above it*, a very high tension pulse is denoted. If, on the other hand, there is very *little tension* the tidal wave will correspondingly be very slightly developed, or it may be entirely absent, and be represented by a falling line with a very low aortic notch (see low-tension pulse tracing, Fig. 9, No. 5). A *dicrotic pulse* (Fig. 9, No. 6) is a low-tension pulse, and the second large wave which is seen near the basal line, in such a tracing, is due to the rebound coincident with the closure of the aortic valve. If the lever of the sphygmograph should descend still lower, and pass *below* the basal line, the tracing so obtained indicates a *hyperdicrotic* pulse.

The *senile* or *atheromatous* pulse tracing (Fig. 9, No. 4) is very similar in appearance to the high-tension pulse tracing. This is due, however, to a different cause. The atheromatous condition of the vessel wall prevents its complete collapse during the heart's diastole. The vessel is, as it were, maintained at a nearly maximum permanent expansion, and this condition is expressed graphically in the tracing.

PERICARDITIS is very rarely a primary lesion. It is most frequently associated with acute rheumatism. It may also occur with Bright's disease, scarlet fever, pneumonia, pleurisy, phthisis, endocarditis, pyæmia, and it may be produced by injuries. Males are somewhat more frequently attacked than females. Throughout childhood the incidence of rheumatism and scarlet fever makes it rather a frequent affection, whereas later in life it is most often associated with Bright's disease. The inflammatory process usually begins at the base of the heart, and thence extends over the rest of the pericardium.

Anatomical Changes.—If we take as a type the pericarditis which occurs in the course of acute rheumatism we find the following changes:—In early stages the membrane is congested and its surface roughened by the deposition of a thin layer of fibrin. Entangled in the meshes of the fibrin there is always a slight serous exudation. Ultimately the two opposed surfaces of the sac may be separated by a layer of fibrinous exudate, one-eighth or a quarter of an inch in thickness. On account of the continual movement of the heart this exudate is laid down in a somewhat unequal manner, or in layers, just as the tide leaves the sand ribbed; or sometimes it is shaggy like the rough surface of tripe. The effusion of serum, at first slight, becomes larger, and as it increases distends the pericardial sac in all directions, and may displace the heart. After a time absorption may take place, or permanent adhesions may result from organisation of the fibrinous exudate.

Varieties of this process may occur, and there may be *pericarditis* with the production of fibrin, serum, and a good deal of pus. This variety may have the purulent character from the onset, or it may begin as previously described, and afterwards assume the purulent character. Besides the ordinary pyogenic streptococci and staphylococci, the pneumococcus and in tubercular cases the tubercle bacillus have been found. While the nature of the fluid cannot be accurately determined without aspiration, yet we may say that in rheumatic cases the effusion is usually sero-fibrinous; in septic and tuberculous cases it is often purulent from the onset; in nephritic, senile, and tuberculous cases it is sometimes hæmorrhagic.

Symptoms.—On auscultating at an early stage of the disease a to-and-fro friction sound is detected, from the serous membranes not gliding upon each other with the ease and smoothness of health. Essentially the sound is of a rubbing character, and has been compared to the unfolding of a crisp bank-note, to the rustling of silk, or to the creaking of new boots. The sound heard is essentially that of friction—light rubbing, scratching, grating,—and the impression borne to the ear is distinct from the generally soft blowing character of an endocardial murmur. It is also distinctly superficial, seeming to proceed, as it were, from a point immediately beneath the chest wall, and further, its occurrence is irregular in the cardiac cycle, following at one time the systole, at another the diastole. Most commonly, also, both of the heart sounds remain audible, the friction murmur being interposed between them. It is not, moreover, propagated to such a distance as endocardial murmurs. These distinctive diagnostic points having been noted, it will be understood, in accordance with what has been observed as to the nature of the effusion, that the friction murmurs are like those of pleurisy, most intense at the beginning of pericarditis, when the amount of exudation is small and the two layers of pericardium are permitted to come closer together, and towards its termination when the fluid portion of the exudation is absorbed, and only the firm fibrinous part is left behind. At the time when the exudation is most abundant, the sound may partly disappear.

In many cases complicating endocarditis the pericardial condition may only be recognised after death. The loud systolic murmur may mask any friction sound.

The præcordial dulness assumes a pear-shape form, with its apex upwards towards the second left costal cartilage, its base corresponding with the lower edge of the sixth rib; the dulness varies to some extent with the position of the patient. The effusion may reach its height in two or three days, and diminution of the dulness from above downwards may be observed in three or four days, while the friction rub often remains for some time. In many cases doubtless more or less adhesion of the pericardial surfaces takes place. Can we tell if the pericardial adhesions have taken place? We have no certain signs, but we suspect this to be the case if dulness is unaltered by position or deep inspiration, if, similarly testing, the apex beat remains the same, and if one or more intercostal spaces or the epigastrium seem drawn in along with each pulsation of the heart.

The general symptoms attendant on pericarditis vary, and are sometimes so insidious as to attract little attention. Yet a careful daily examination of the heart should always be made in treating a case of acute rheumatism, and the prominent features of the case noted. If the heart be involved the restlessness and dyspnœa of the patient will attract attention; even though there may be no stabbing pain there is always more or less distress and discomfort in the cardiac region. The pulse at first may not be much affected, but as effusion goes on it becomes rapid, small, and irregular, and may present the character of *pulsus paradoxicus*, in which during each inspiration the pulse beat is indistinct or lost. The face is anxious and pinched, and as the effusion increases, the patient cannot lie down. These symptoms point to embarrassment of the action of the heart from the pressure of the effusion, and they are more apparent after the fatigue of speaking, or taking food, or after any emotion. The existing fever in a case of acute rheumatism may not be increased by the advent of pericarditis, but occasionally the temperature rises to 105° or 106° F., and in other cases, occurring with a different affection, there is evidence of fever by loss of appetite, dry tongue, thirst, and scanty urine. Disturbed sleep or insomnia is associated with restlessness in the early stage, and in the later stages of severe cases there may be low delirium and prostration. Notwithstanding the grave condition of matters in the majority of cases of pericarditis with acute rheumatism, the symptoms gradually subside. A fatal issue is attended with increased nervous disturbances, more delirium, convulsions, or coma.

Prognosis.—Pericarditis is a grave malady; yet, when occurring in rheumatic fever, it is not so much to be dreaded for its immediate as its after consequences, in producing endocarditis and leaving permanent valvular disease. Should it supervene in the course of a chronic disease, it is generally fatal, the prognosis being specially grave in Bright's disease and in cases of copious and rapid effusion. The prognosis should be determined rather by the complication than by the disease itself.

Treatment.—Pericarditis is usually associated with acute rheumatism, and is observed often in hospital cases on the day or night of admission, the seventh or eighth day probably of this fever. Salicin or the salicylate of sodium then does not seem to avert pericarditis; but there is every reason to suppose that had the salicylate treatment been used from the commencement of the rheumatic fever, in all probability the pericarditis would have been averted, for before the time mentioned the primary fever would have been arrested.

If, however, in a case of rheumatism, symptoms of pericarditis appear, the line of treatment does not necessitate the abandonment of the salicylate treatment. Pericarditis is an evidence, like the joint affection, of the rheumatic poison circulating in the blood, and if we believe that the salicylate treatment is the best way to eliminate this poison, then we must adopt this treatment or continue it if begun. The further indications required by the implication of the heart resolve themselves into the relief of pain, the support of the system, and the absorption of the effusion. If the pain be not severe, an ice-bag or Leiter's tube may be tried, with the precautions to prevent undue chilling—the application of hot bottles to the lower extremities, and an hourly or half-hourly determination of the temperature. When the use of the ice-bag is objected to, and when the pain is severe, six leeches may be applied over the præcordial region followed by warm fomentations sprinkled with tincture of opium. Hypodermic morphine injections may be necessary to promote sleep and to aid in alleviating the pain. If the heart's action tends to fail, small doses of tincture of digitalis, 5 m. every two or three hours, should be given with brandy. The administration of digitalis must be carefully watched, and must be suspended if the pulse does not gain force by its use. To promote absorption in rheumatic cases the application of a full-sized blister is better than any other method. As a rule this application is attended with excellent results, and the effusion diminishes. If, however, it fails, and if excessive effusion causes great dyspnœa, or if it is found that the effusion is purulent, then paracentesis should be performed. The puncture may be made in the fourth interspace either at the left sternal margin or an inch from it. With the sero-fibrinous exudate, such as commonly occurs after rheumatism, aspiration is sufficient; but when the exudate is purulent, the pericardium should be freely incised and the pus let out. A soft drainage-tube should be inserted, and it is imperative that a FREE OUTLET should always be maintained.

Diet.—Milk, or bread and milk, light puddings, whipped eggs. After *paracentesis*, nourishing soups and stimulants.

ENDOCARDITIS.—By endocarditis is meant an inflammation of the endothelial membrane of the heart. It is observed most often in cases of acute rheumatism and chorea; less frequently in the course of scarlet fever, gonorrhœa, erysipelas, or pyæmia; occasionally it has been noted in acute and chronic Bright's disease, in syphilis, and after parturition. The endocardium, if seen in the early stage, is marked by increased redness and vascularity, and by an appearance of thickness and dulness. Later on, vegetations form on the valves along the lines of pressure. The valves become thickened, puckered or adherent to each other, and their action is thus permanently impaired.

Symptoms.—Indications of its existence in the diseases mentioned may be shown by signs of general uneasiness about the heart, increase of fever, restlessness, and sweats. Subsequently a mitral systolic murmur is heard. In many cases the severity of the original affection masks the signs of endocarditis, and the permanent valvular mischief which it leaves is the only evidence of its having occurred.

The immediate prognosis is favourable. The treatment is the same as in pericarditis.

ULCERATIVE ENDOCARDITIS.—In many microbic diseases, as pyæmia, puerperal fever, pneumonia, or more rarely as a primary affection, the endocardium may be invaded by microbes. Ulcers form, which may lead to destruction of the valves or to thinning, formation of aneurysms and perforations. Emboli causing metastatic abscesses in the spleen, kidney, and skin are common. The affection of the heart may be masked in the general pyæmic condition. Thus a typhoid state with irregular temperatures, rigors, and petechial hæmorrhages may occur without any definite cardiac symptoms. In another class of cases meningitic symptoms predominate. In the more chronic cases, in which the infection supervenes on an old endocarditis, the onset is usually insidious. Rise of temperature may be first noted. In a few days rigors and sweating occur. The rigors are irregular in their appearance. The pyrexia may also be irregularly intermittent. Infarctions in various organs may cause sudden pain in them. There may be attacks of hemiplegia or aphasia. The spleen as a rule is enlarged. Hæmorrhages into the retina or into the skin are occasionally noted. There may be a septic rash. Examination of the heart will probably show murmurs. The murmurs of infective endocarditis cannot, however, be distinguished from those due to simple endocarditis. They are apt to vary in intensity. As a rule the left side of the heart is attacked. Discovery of micro-organisms in the blood would help to confirm our diagnosis.

The prognosis is very unfavourable, though some cases recover.

Treatment.—Fränzel recommends large doses of quinine and free stimulation. Benzoate of sodium and sulpho-carbolate of sodium are also used. Recently good reports are given of the injection of anti-streptococcic serum.

VALVULAR DISEASE (CARDIAC MURMURS).—On listening over the cardiac region in health, two distinct sounds are heard following each other at regular intervals. These sounds have been termed first and second, systolic and diastolic, as the one corresponds to the contraction (systole), the other to the filling up (diastole) of the ventricles. The first sound has its maximum intensity at the apex of the heart; the second at the base, or, more accurately, on a level with the third rib and a little above and to the right of the left nipple, near the left edge of the sternum. In determining, therefore, the state of the heart, it is necessary first to apply the stethoscope at the apex and next at the base on the spots mentioned, and to ascertain whether or not a murmur or murmurs exist, denoting a variation from the sounds of health, and if so, what valve or valves are implicated. If of *exocardial* origin, as has been explained under pericarditis (p. 216), the sound heard is rubbing or grating. It is essentially superficial. It does not follow permanently either the systole or the diastole. It is irregular in point of time in the cardiac cycle. In order to realise what is to follow, it is advisable to leave out of account the right side of the heart, and to fix the attention entirely on the left side, and more particularly the left ventricle, which has two valves in connnection with it—the mitral and the aortic. With the contraction of systole of the ventricle

(Fig. 10), the mitral valve is closed, to prevent blood flowing back into the auricle, and the aortic valves are laid back to allow it to go freely away on its circuit. With the filling up or diastole of the ventricle, the reverse of this happens (Fig. 11); the mitral valve opens and the aortic valves are closed to prevent the blood flowing back from the aorta into the ventricle. If disease has involved one or more of these valves, interfering with their healthy action, a murmur or murmurs are occasioned, which may be considered "regurgitant" or "obstructive" according to rhythm or the time when they are heard; and thus we may have one or more of four great classes of murmurs, viz. "mitral regurgitation," "mitral obstruction," "aortic regurgitation," "aortic obstruction." The further great practical facts may be dogmatised thus:—Mitral murmurs are heard loudest at the apex, aortic murmurs at the base. If a murmur is heard following the first sound, it may be termed generally a ventricular systolic (V.S.) murmur. If loudest at the apex and diminished or lost at the base, it is due to mitral regurgitation; but if loudest at

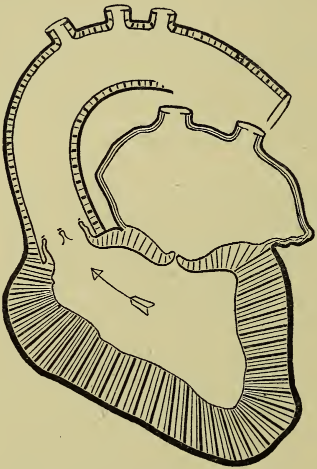


Fig. 10.—Ventricular Systole.

the base, it is dependent on aortic obstruction. If a murmur follows the second sound, it may be termed generally a ventricular diastolic (V.D.) murmur, and as indicating its nature, aortic regurgitant. Again, a murmur may be heard following directly neither the first nor second sound, but immediately preceding the first; it may be termed auricular systolic (A.S.), or presystolic, or, as more definitely recognising its causation, the murmur of mitral obstruction.

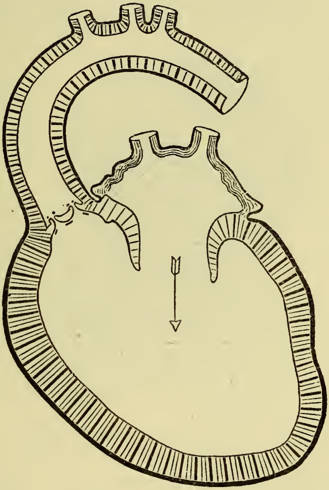


Fig. 11.—Ventricular Diastole.

Attention to these considerations will enable the student generally to detect the nature of the lesion, aided as he will be by the state of the pulse, which as a rule is soft, compressible and jerking in aortic, often irregular and small in mitral obstructive disease; and by the pulmonary symptoms, which are more common and urgent in mitral, while cerebral symptoms or complications are more often associated with aortic disease. I purposely say nothing of diseases of the right side of the heart, as they are rare; and to enter completely into their causation would confuse the conception which it is desirable the student should retain of a single-chambered organ in connection with the subject of heart-murmurs.

The following tables, read, however, in connection with what has been said, can now be understood :—

A.—Mitral obstruction due to stenosis, with presystolic murmur, indicates an impediment to the flow of blood from the left auricle to the left ventricle. Recognised by a purring thrill at apex ; a murmur running up to the first sound and loudest at apex ; pulmonic second sound accentuated or reduplicated ; a feeble, often irregular pulse ; difficulty of breathing after exertion. It occasions sometimes little uneasiness ; sometimes pulmonary congestion and spitting of blood ; sometimes it terminates in sudden death.

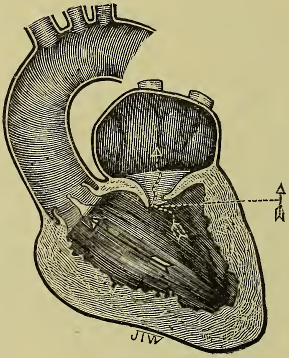


Fig. 12.—Mitral Regurgitation.

B.—Mitral regurgitation, due to incompetence, from imperfect closure of mitral valve, permits blood, during contraction of ventricle, to flow back to the auricle. Recognised by a blowing murmur wholly or partly obliterating the first sound, and heard loudest at the apex ; diminishing towards or inaudible at the base ; confirmed by its being heard at inferior angle of left scapula ; pulse feeble and irregular. Caused by contraction or roughening of segments of valves ; by dilatation of left ventricle ; by irregular contraction of papillary muscles. Resulting in more or less suffering from congestion of lungs, liver, and kidneys: rarely in sudden death.

C.—Aortic obstruction, due to stenosis or narrowing of orifice, prevents blood flowing easily from the left ventricle into the aorta. Recognised by a murmur following the first sound, heard loudest at the base, always propagated to the vessels of the neck, and having its point of greatest intensity at the right border of the sternum in the second intercostal space, sometimes carried with considerable intensity downwards along the sternum; pulse small, hard, and diminished in volume, in later stages soft and slow. Resulting often in little suffering for years in consequence of compensating hypertrophy of left ventricle. But when compensation begins to fail there are frequent attacks of dyspnœa and hæmoptysis, and fits of faintness and dizziness from anæmia of the brain, the patient being conscious, but having no command of motor power. In contrasting it with mitral stenosis, the comparison is far more favourable with regard to the duration of life.

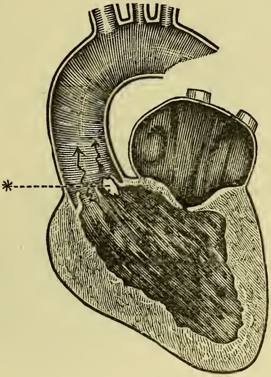


Fig. 13.—Aortic Obstruction.

D.—Aortic regurgitation is due to incompetence from imperfect closure of the aortic valves. Characterised by a murmur (V.D.) accompanying the second sound, whirring, rushing, diffused more or less along the whole sternum, although perhaps loudest at the third right costal cartilage. If the insufficiency is very great, a reduplicated murmur, both systolic and diastolic, may be heard on pressure with the stethoscope when auscultating over the crural artery; while a shotty jerking pulse—*pouls de Corrigan*—is characteristic. This pulse is often called the "water-hammer pulse," or "pulse of unfilled arteries." So long as the increased force of the left ventricle suffices to prevent any stagnation of the circulation, there may be years of undisturbed good health; but when once compensation becomes imperfect, the reaction on the venous system—induced by the stagnation and the dropsy—leads to a rapidly fatal result, and sometimes it ends in sudden death. Sudden attacks of dyspnœa and oppression, a spasmodic pain beneath the sternum, are often observed; fainting and dizziness, indicating disturbed cranial circulation, are most unfavourable symptoms.

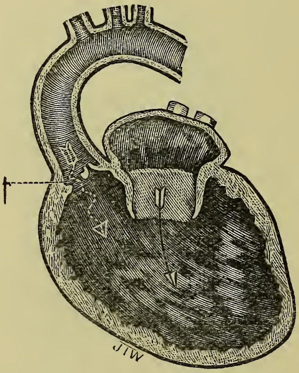


Fig. 14.—Aortic Regurgitation.

E.—Tricuspid obstruction: rare.

F.—Tricuspid incompetence (V.S.), regurgitation due to imperfect closure of tricuspid valve. Recognised by increased dulness of right side of heart; diffused pulsation over the right ventricle, made visible to the eye by epigastric pulsation; murmur with the first sound; pulsation and fulness of jugular veins; dyspnœa and dropsy; generally associated with mitral regurgitation or emphysema.

G.—Pulmonary stenosis: rare (congenital).

H.—Pulmonary incompetence is also rare, and is detected by its situation over the pulmonary valves, by its loudness and non-propagation from this spot.

It must be remembered that these murmurs are frequently combined—the most frequent combination being aortic obstruction and regurgitation; mitral obstruction and regurgitation; various combinations of mitral regurgitant and aortic murmurs. These murmurs, which are termed "organic," are permanent, and must be distinguished from another class of murmurs, denominated "functional," "inorganic," "accidental," "anæmic," "hæmic" murmurs. These murmurs are probably not due to an altered or anæmic condition of the blood so much as to an actual mitral incompetence induced by a flabby condition of the heart, which, in common with the whole muscular system, suffers from a defective nutrition. Functional murmurs are generally associated with chlorosis and other chronic diseases leading to altered condition of the blood. They are also sometimes noticed in acute diseases, as pneumonia, typhus, scarlet fever, or small-pox. They are distinguished by the following considerations from the permanent or organic murmurs:—

1. They are soft, feeble, blowing; never harsh or rasping.
2. They are always systolic, never diastolic.
3. They are most frequently heard best over the pulmonary area, next at the mitral; very seldom at the aortic or tricuspid valve.
4. They are, especially in chlorosis, combined with murmurs in the veins of the neck.
5. If the health improves, they disappear.

ANY PRE-SYSTOLIC OR DIASTOLIC SOUNDS INDICATE ORGANIC CHANGES. The diagram on the succeeding page indicates the points of greatest intensity of the chief murmurs indicated.

General Symptoms.—In any form of valvular heart disease, when compensation fails, when the heart's contractions are unequal for the increased labour, then certain symptoms appear evident to the sufferer. The relation between respiration and circulation is changed, and the patient becomes breathless on increased exertion, as walking up stairs or up a hill, and he has to stop breathing to recover the proper rhythm. This is termed "cardiac dyspnœa."

Patients with heart disease also complain of palpitation, but it is to be remembered that this is sometimes only a symptom of flatulent derangement of the stomach. Yet when there is veritable heart disease the gastric symptoms also become very prominent, especially when the stomach is distended with food, which presses the diaphragm upwards against the heart, and thus acts mechanically in causing cardiac embarrassment.

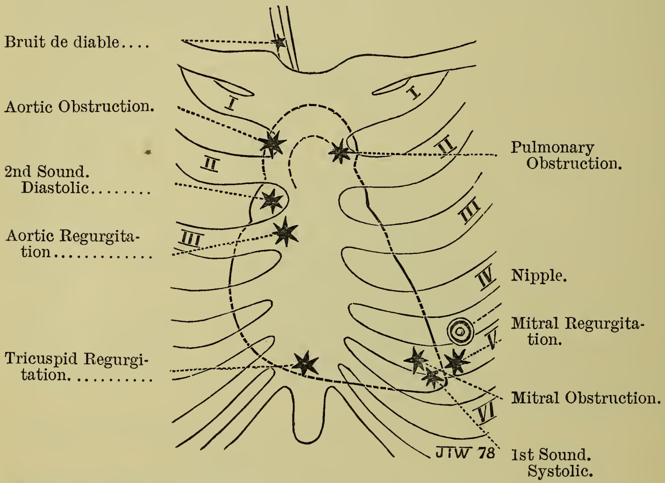


Fig. 15.—Auscultation of Heart Sounds. Points of Greatest Intensity of Different Murmurs.

Diagnosis.—The chief points to be attended to in forming a diagnosis as to diseases of the circulatory system are as follows:—

1. Apex-beat of heart. Normal or abnormal? Impulse feeble or strong, or attended with thrill?

2. Auscultation. Normal? Murmurs (functional or organic), systolic V.S. or diastolic V.D., or pre-systolic A.S., or exocardial? Friction sound?

3. Percussion. Normal? Area increased or diminished?

4. Pulse. Changes in frequency, rhythm, force, volume, tension.

5. General history.

Prognosis.—No very definite rules can be laid down in the prognosis of heart disease, unless accompanied by so many exceptional circumstances that they become valueless. While this is the case it may be said generally that tricuspid disease has the worst prognosis; next mitral regurgitant, next mitral obstruction, next aortic regurgitant, and lastly, the most favourable prognosis may be given in aortic obstruction.

Both forms of aortic disease are compatible with prolonged life and little suffering, the most favourable indications being that the second sound is heard over the carotids, and that the murmur is conducted to the left apex. This latter fact shows that the heart is not being robbed of its blood and consequent nutrition, as the aortic segment is non-coronary in its blood supply. When non-compensation exists in aortic cases, as evidenced by swelling of the feet and albumen in the urine, the disease marches rapidly to a fatal termination, this being rarely averted for more than fifteen months.

In mitral disease the symptoms of non-compensation are revealed by pulmonary embarrassment—dyspnœa, cough, etc., and the danger of cerebral embolism is always present. Yet with quietness and rest, and freedom from worry, both forms of mitral disease are compatible with long life.

In what class of valvular disease is sudden death most common? The broad answer is, In aortic disease more than mitral regurgitant. Mitral obstruction is, however, frequently terminated by sudden death through cerebral embolism, and this tendency is heightened if mitral regurgitation and obstruction coexist. In all the valvular diseases the Cheyne-Stokes respiration is a sign of impending death.

Treatment.—The cardiac tonics in use are digitalis, caffeine, strophanthus, and convallaria, which last is non-official. They have all a distinct action on the heart and various secondary effects, as increase of blood tension and production of diuresis. From their similarity of action to digitalis they have been designated "the digitalis group." They are intimately associated with the treatment of diseased valvular conditions of the heart—in fact, treatment here depends chiefly on the apprehension of the nature of the lesion, the time of its discovery, and the giving or withholding of a cardiac tonic. A valvular organic murmur, single or combined, having been detected, all prophylactic treatment is valueless; and we possess no means of remedying what must be a permanent defect. Post-mortem appearances in heart disease indicate the compensatory efforts of nature to overcome or modify the various obstacles to, and deficiencies of, the proper flow of blood from the central organ. The indications of all well-directed treatment, therefore, are to follow the suggestions of nature, and assist the development of compensation when already in existence, to maintain it as long as possible, and to moderate over-compensation. Further, in affection of the aortic valves, clinical experience testifies that when the heart muscle is well nourished, and the bodily stamina maintained by a carefully regulated diet, avoidance of all unnecessary excitement, spirituous liquors, and smoking, perfect compensation may be maintained for years without any medicinal agent, and average good health may be enjoyed. When the mitral valves are implicated, the same average good health cannot be maintained, for there is always more or less pulmonary mischief revealed on exertion, or through fatigue or excitement, and nature cannot give compensation so complete as to obviate the phenomena of failing health. Hence, while the same precautions previously mentioned should be strictly, even more strictly enjoined, we should endeavour, on the first detection of mitral disease, whether obstructive or regurgitant, to assist nature's compensatory efforts by means of digitalis, which has stood the test of a hundred years. When its administration is cautiously regulated in mitral obstruction, it will be found, without entering too minutely into the process, to increase the fulness and regularity of the pulse; to diminish the tendency to spitting of blood; to heighten arterial tension and counteract approaching dropsy. So also in mitral regurgitation, it dismisses the feeble irregular contractile efforts, and concentrates cardiac action in well-directed beats, and thus saves the over-distension of the right heart. In both cases it may be continued for a considerable time; but if the urine is found to diminish instead of increase somewhat in quantity, it is advisable at once to stop it, and to resume it again as circumstances and prudence may suggest. The tincture is the most convenient form for continuous administration, in doses of 5 to 10 minims, with a similar quantity of tincture of perchloride of iron. In the form of a freshly-made infusion of the leaves, in teaspoonful doses thrice daily, its diuretic properties, when these are chiefly desired, are more apparent, and it can be given in this way.

While it is inadvisable to give digitalis in the earlier stages of aortic disease, it will be found in advanced cases, when dropsy has begun, when the dyspnœa is intense, when the compensatory effort has been taxed to its utmost limit—theoretical considerations notwithstanding—that digitalis in infusion, with acetate of potassium, or in pill with squills and mercury, produces marked benefit. Probably this may partly be explained by the fact that in such long-standing cases all the valves of the heart are more or less involved. For, granting that the aortic valves were primarily diseased, we often see in this "stage of disturbed compensation," with the pulse low, the action of the heart irregular, and the urine scanty, that the diuretic value of digitalis is inestimable in these circumstances. Foreign observers speak highly of its combination with quinine, three grains of the sulphate being administered thrice daily, with from one to two grains of the powdered leaf. Strychnine and arsenic, either alone or in combination with digitalis, are valuable cardiac tonics.

To ease also the irritability attendant on all forms of cardiac disease, and too surely evidencing exhaustion of the organ against mechanical difficulties, the application of cold to the region of the heart is useful. For this purpose, a metal or gutta-percha vessel filled with water or ice, and having a concave surface to fit in against the ribs, may be employed for two hours daily. To obviate the stagnation and slower circulation in the liver and abdomen seen in early stages, rhubarb with quassia or gentian may be prescribed; or, better still, if circumstances permit, a few weeks may be profitably spent in drinking the waters of Homburg or Kissingen, or bathing in the warm springs of Soden. Such means remove the complaint temporarily, and with renewed appetite there comes increased strength.

Next to digitalis, strophanthus is the most powerful and efficient cardiac tonic. It has this advantage over digitalis, that it does not create digestive derangements. It should be prescribed in the form of the tincture, at first in a dose of 5 minims, which may be subsequently increased to 10 minims in a wine-glassful of water thrice daily. The citrate of caffeine in doses of 2 to 10 grs. has relatively a more rapid action on the circulation than either digitalis or strophanthus; but the results are not always so permanent and satisfactory as with the other two medicines mentioned. Further, it should not be taken at night, as it is apt to cause sleeplessness. The disagreeable effects of caffeine on the central nervous system may be avoided by the use of sodio-salicylate of theobromine ("diuretin") in doses of 40 to 60 grains daily. When palpitation and dyspnœa are the prominent symptoms rather than deficient cardiac contraction, the fluid extract of convallaria in 8 to 10 m. doses, thrice daily, seems to do good service. In advanced heart disease it is less powerful than the other cardiac tonics, but it appears to be more effective in functional disorders, as in anæmia or hysteria, and in the depression and irregularity caused by the excessive use of tobacco. Certain risks attend the administration of cardiac tonics in valvular disease of the heart.

I. The first great risk is from syncope. Whenever, therefore, cardiac tonics are given in full doses, and their action is systematically continued, the position of the patient should be *recumbent*. He should be helped to sit up in bed to take food, and should not rise unaided for the purpose of micturition. When given in smaller doses such precautions are not necessary.

II. Since the action of digitalis is cumulative, it is advisable not to continue, without a cessation of two days, its administration after the expiry of four weeks.

III. When the arterial tension is high, as in the case of heart disease associated with granular kidney, when there is evidence of an atheromatous condition of the vessels, and when the heart seems unable to propel the blood into the aorta, then cardiac tonics should not be given, for attendant on their use is the risk of an apoplectic seizure. Purgatives, diuretics, and diaphoretics should then be relied on. In addition we may state that it is inadvisable to give digitalis if (1*st*) it produces vomiting or giddiness; if (2*nd*) there is intermittency of the pulse, or if intermittency of the pulse or diminution of the urine is brought on during its use; if (3*rd*) the condition of fatty heart exists.

Casca bark in the form of tinctura erythrophlœi v. to x. m. sometimes relieves advanced mitral disease when other cardiac tonics fail. Supplementary to the treatment mentioned are purgatives, as the compound powder of jalap, which may be given two or three times a week. If the kidneys are healthy, the "imperial drink," containing cream of tartar, is useful; so also is copaiba. Mercurials are not ordered when dropsy depends on kidney disease, but increasing testimony bears out the advisability of giving calomel in $\frac{1}{2}$-gr. doses, thrice daily, in cardiac dropsy. It seems, by relieving engorgement, to act as a diuretic. Oertel recommends systematic exercise in valvular heart disease, and this exercise, he states, should not be on level ground, but by oft-repeated and gradually-lengthened mountain-climbing. He gives direction for carrying out this method as follows:—

"With one step they (patients) must perform an inspiration, with the next an expiration in even time, and pursue walking and breathing in this way until they are forced to stand still, to bring into equilibrium the cardiac and vascular excitement, by deep inspirations. When the respiration is again free, if the violent palpitations of the heart are quelled, the patient resumes the ascent till the same phenomena force him to rest again. By perseverance in this method daily the respirations become freer and the disturbances of circulation less marked, so that a patient may be able to make an ascent up to 500 or even 1000 metres."

While this treatment may be guardedly tried in slight affections of the heart, it is certainly inadvisable where there is reason to suppose that the condition is one of fatty heart, or of weakness of the cardiac muscle, or of imperfectly compensated valvular disease. To attempt in such cases "to walk themselves into condition" would be to patients hazardous in the extreme.

Schott's system of the treatment of chronic diseases of the heart by baths and exercise appears more rational and certainly less hazardous than Oertel's. The baths employed are those of Nauheim, containing 1½ per cent of chloride of sodium, with about the same amount of chloride of calcium, salts of iron, a proportion of natural carbonic acid made to vary according to the circumstances of the case, and they possess a temperature of from 88° to 95° F. An interval is imposed after each second, third, or fourth bath taken in daily succession, and it is prescribed that each bath should be followed by an hour's rest in the recumbent position.

Their effect on the pulse is at once to reduce its frequency and to increase its strength, to cause cutaneous excitation, amounting in some cases to actual redness, and to relieve congestion of deeply seated organs. The exercises named *Widerstandsgymnastik* consist of various muscular movements in orderly succession, persevered with for from 10 to 20 minutes and carefully regulated so as to avoid over-exertion. The baths and the exercise and the mode of life combine to secure a shrinking of the area of dulness in dilatation of the heart, and benefit may be expected to accrue in most cases of chronic heart disease, whether of valvular or parietal incidence, except where such conditions have led to or coexist with either advanced myocardial or arterio-sclerotic degeneration or aneurysm of either the heart wall or a great vessel.

Dietetics.—The diet in heart disease should be well regulated. The nutrition of the body acts on the nutrition of the heart, and the better the nutrition of the system generally is, the longer will the heart resist degeneration. As a rule substances tending to form fat should be avoided in the dietary of a patient with any form of heart disease. Sugar, starchy food, and sweet vegetables should be interdicted;

nitrogenous and albuminoid articles should be taken, but not in quantities which tend to overload the stomach. The use of alcohol, strong tea, coffee, or tobacco is to be prohibited, more especially in lesions of the mitral valve. The bowels should be gently moved once daily. Straining at stool and lifting heavy weights are attended with danger. The body should be warmly clothed, and the passions and emotions kept under perfect control. Exercise daily without fatigue is permitted.

The question is often asked of the medical adviser, by parents or guardians of young persons who are the subjects of valvular disease of the heart—What kinds of exercise may be permitted? Until compensation is established, Dr. Mitchell Bruce says, "football and paper chases are to be entirely forbidden; whilst more or less 'stupid games' of cricket and tennis may be permitted. Swimming, whether in the sea, river, or swimming-pond, must be interrupted for a time; bicycling may also have to be interdicted unless the country be level and the boy's ambition moderate.

"When compensation has been completely established muscular exercise should be ordered, the amount and the kind depending upon the nature of the primary lesion. Dancing will have to be forbidden girls for a time, to be gradually resumed in the mildest form, under perfectly non-exciting circumstances."

DISEASES OF THE MUSCULAR SUBSTANCE OF THE HEART

HYPERTROPHY AND DILATATION

HYPERTROPHY OF THE HEART.—As a preliminary inquiry to the subject of hypertrophy of the heart and other cardiac affections, it may be asked, "What is the area of superficial cardiac dulness in normal cases?"

To answer this the student should percuss very carefully, employing pen and ink to dot out the results of his investigations on the chest. It will then be found that he has a map roughly triangular in form, the right side of the triangle being the mid-sternal line from the level of the fourth chondrosternal articulation downwards; the hypotenuse being a line drawn from the same articulation to a point corresponding with the apex-beat; the base being a line drawn from the site of the apex-beat to the point of meeting of the upper limit of liver dulness and the mid-sternal line.

How are the valves situated in the area thus mapped out? FROM ABOVE DOWNWARDS THE PULMONARY COMES FIRST, THEN THE AORTIC, THEN THE MITRAL, AND LASTLY THE TRICUSPID; AND IN REGARD TO THEIR DEPTH FROM THE SURFACE, THE TRICUSPID IS THE MOST SUPERFICIAL, THEN THE PULMONARY, NEXT THE AORTIC, AND DEEPEST OF ALL IS THE MITRAL ORIFICE. Their exact anatomical arrangement is as follows:—The tricuspid orifice extends from the junction of the fourth left costal cartilage with the sternum, behind that bone to the articulation of it with the sixth right cartilage; the mitral orifice lies to the left of the tricuspid valves, immediately behind the fourth costal cartilage; the pulmonary orifice is situated immediately behind the left border of the sternum, at the junction of the third costal cartilage with that bone; the aortic orifice occupies the third interspace, and is about half an inch lower than and to the right of the pulmonary orifice behind the sternum.

These facts being remembered, to understand what is meant by the term "hypertrophy of the heart," it is necessary also to have some definite idea of the size of the organ in health, and of the relative thickness of the walls of its different chambers. The size of the heart, all authorities seem to agree, is, in health, about the same dimensions as the closed fist, and it weighs 8 to 10 ounces. The left side of the heart has to do more active work than the right, and nature has accordingly provided it with increased thickness of the muscular tissue to accomplish this. The relative thickness is as follows:—The right side is to the left as two to five; or speaking generally, the thickness of the left ventricular wall more than doubles that of the right.

Hypertrophy of the heart is therefore most frequently found in the left side of the organ, or that side of the pump which has the most work to do.

This hypertrophy may be of two kinds. In the *first* there is simple enlargement of the muscular walls without dilatation of the corresponding chamber.

In the *second*, not merely are the walls thickened, but the chamber is also increased in size. The first is termed "simple" or "passive," the latter "active" or "eccentric." The first is rare, the second frequent. Dilatation and hypertrophy thus most frequently go together, and the reason for this is obvious if we look at the condition which causes the hypertrophy.

Etiology.—In nineteen cases out of twenty there is some obstacle to the transit of blood to or from the organ. This obstacle may be in the heart itself, or may be due to its being pushed from its accustomed seat by disease of other organs, such as pleurisy. The former cause is the more common. Thus, if the aortic valves, which act as sentinels to guard and guide the blood from the ventricle, become incompetent, allowing the blood to flow back again, or obstructed, not permitting it to get properly out of the chamber, hypertrophy must result. The heart has to put on increased force to overcome the obstacle, and has to acquire increased space to contain the greater quantity now in the chamber. If the mitral valve is diseased, there will be an increased quantity of blood within the left auricle, and hence the chamber must be larger. The auricular action is not, however, so forcible as the ventricular, and as there is not so much increase of power needed, auricular dilatation often exists without hypertrophy.

On the right side of the heart we find increased size and thickness of the right ventricle, where there is some obstacle or too great patency in the pulmonary or tricuspid valves, or some hindrance in the diseased state of the lungs to the proper circulation of the blood, as from emphysema. But cardiac hypertrophy, apart from kidney or lung disease or valvular derangement, may arise from over-exertion of the organ (see Irritable Heart, p. 243); from excessive smoking and liver congestion in persons of sedentary habits who live too freely; and occasionally from the effects of acute rheumatism, without any disease of the valves.

Symptoms.—In general the symptoms are developed slowly. They may be broadly enumerated as follows:—dyspnœa, palpitation, pain localised about the heart, and inability for active exertion, such as walking, running, or going up stairs quickly. Symptoms of granular kidney disease, more particularly alluded to at p. 366 *et seq.*, will also often be observed. The pulse is usually strong, powerful, and jerking; but it varies with varying causes. Patients suffering from severe dilatation and insufficiency of the auriculo-ventricular valves of the heart sooner or later present signs of venous congestion in the lungs, liver, spleen, or kidneys; and dropsy of the subcutaneous tissue beginning at the lower extremities, but involving at an early date parts like the scrotum and the eyelids, which afterwards is followed by transudation into serous cavities such as the pleura or peritoneum.

On percussion, the area of cardiac dulness is found to be increased. The direction of the increased dulness varies according to the part of the heart affected. If it be the left ventricle, the extension will be downwards and to the left, giving an elongated shape; while, if the right ventricle be hypertrophied, it comes to form the apex, and thus the outline is square, and the dulness extends to the right. There is a sensible and very distinct heaving impulse communicated to the hand or the stethoscope. The heart-sounds are heard over a largely increased surface, and the apex-beat is carried lower down, and to the left of its normal position. Further, if the hypertrophy be *simple* with little or no dilatation, the first sound is often dull and muffled. Dr. Walshe described it as "prolonged" and "weakened," the sensation borne to the auscultator's ear being rather "one of impulse than of sound." When dilatation and hypertrophy exist together, the first sound may be loud, full, and pronounced, but with dilatation alone the condition of the heart is soft, and the first sound may thus be very weak and faint; while, should there be valvular disease, murmurs will be heard, varying as to site and peculiarities with the valve implicated.

If we consider that hypertrophy and dilatation generally coexist, a practical summary of the two conditions may be expressed thus: IF THE HYPERTROPHY IS GREATER THAN THE DILATATION, THE AREA OF DULNESS OF THE HEART IS CHIEFLY INCREASED FROM ABOVE DOWNWARDS; BUT WHEN THE DILATATION IS IN EXCESS, THE AREA OF DULNESS IS GREATER TRANSVERSELY.

Treatment.—Slight hypertrophy requires little treatment, for when the cause of the hypertrophy is removed, the affection ceases to be troublesome. In advanced cases, the indications of treatment are to relieve as far as possible the ventricles of work, and increase the vigour of their action, and at the same time to deplete the venous engorgement. Hence six or eight leeches should be applied over the liver and the bleeding aided by hot poultices. Internally calomel or blue pill in doses of from one to five grains is preferable to other purgatives. A moderate dose of these should be given every third night with a diuretic mixture during the day. The heart, being relieved of work, may be urged to more vigorous action by special heart tonics, such as digitalis, strophanthus, or caffeine, with which strychnine may be combined with advantage.

Dietetic Treatment.—The dietetic treatment referred to at p. 234 is here applicable with these adjuncts. If the patient is of full and plethoric habit we should restrict the use of rich food, all alcoholic stimulants, tea or coffee, and the abuse of tobacco; if the patient is of weak and feeble frame, we should order a diet which strengthens and gives tone to the system.

ATROPHY OF THE HEART.—In contradistinction to hypertrophy or enlargement of the heart, with increase of the muscular substance, we sometimes find the heart atrophied or diminished in weight. The muscular substance becomes pale, soft, and flabby, and easily broken down. The normal weight of the organ may thus be reduced to one-half, and its chambers are small.

The simple form of atrophy is the result of debilitating disease, such as fever, cancer, marasmus, phthisis; or it may be congenital; or caused by disease of the vessels which nourish the heart's substance—the coronary arteries. It is thus rather a post-mortem appearance than a distinct disease.

Symptoms.—If there is marked diminution of the size of the heart, the area of cardiac dulness will be decreased. The smaller quantity of blood contained in the cavities, and the feebler contracting power of the organ, will render the impulse weak and the heart's sounds indistinct. The pulse will also be found to be small. There are, however, no certain diagnostic signs.

FATTY DEGENERATION OF THE HEART.—This may arise either from diminished blood-supply or from deficient nourishment owing to poverty of the blood in anæmic and toxæmic conditions. Fatty granules appear in the muscle fibres, and the heart wall becomes streaky and unduly friable. If due to diminished blood-supply there is often increase of fibrous tissue. The fatty heart is feeble, and may be more or less irregular. There is commonly some dilatation. The first sound is indistinct. Anginous attacks are frequent. Other symptoms are weakness and giddiness with slow pulse—30-40. In advanced cases Cheyne-Stokes respiration may be noted. As a rule all the functions of the body are sluggish. Treatment consists in improving the general health by tonics. Gentle exercise is useful. The bowels should be kept regular and the diet should be light and nutritious.

Fatty Infiltration.—In this condition the fat under the pericardium is largely increased, and may be found extending into the muscular wall and separating the fibres. It is usually associated with general adiposity, but may be secondary to local atrophy of the muscle. The patient is usually middle-aged: he eats too much and takes too little exercise. His complaint is of breathlessness. The pulse may be regular but feeble. The apex-beat is feeble and the heart-sounds muffled. There may be asthmatic attacks. Under careful dieting and graduated exercise the condition may improve. The diet should be chiefly nitrogenous, fats and carbohydrates being curtailed.

ANGINA PECTORIS.—To a disease exhibiting many uniform and characteristic symptoms, and usually considered as depending on some structural derangement of the heart, Dr. Heberden in 1768 gave the name of Angina Pectoris (the breast pang). It is a disease of middle life or advanced age, and is more common in men than women. In its well-marked and typical form fortunately the disease is rare.

Symptoms.—The first attack is sudden, usually coming on when the patient is walking up a hill or against the wind shortly after breakfast, or it may occasionally be experienced for the first time when a person, who has never before suffered from it, is awakened by it from his sleep. The pain is referred to the sternum, a little inclined to the left side, from which point it shoots across the breast to the left arm, and appears to terminate at the elbow. In some cases it extends to the right breast, and passes down the right arm in a similar manner. The pain is accompanied with a feeling of suffocation and dread of impending death. The countenance is pale and covered with sweat; the pulse is more or less small and feeble; while consciousness is unimpaired. At first the paroxysms last only a few minutes, and recur only at long intervals. Gradually they lengthen and recur with increased frequency, being evoked not merely when walking, but when sitting or lying down, and by the slightest bodily exertion or mental anxiety.

Etiology.—Some consider it merely neuralgic, commencing for the most part in the pneumogastric nerve, and spreading in different directions. Militating against this theory is the fact that it seems to be brought about by what disturbs the heart's action, viz. mental emotion and bodily exertion, and especially that it is so often *suddenly fatal.* Dr. Jenner, the discoverer of vaccination, in 1778 attributed it to obstruction of the coronary arteries, this obstruction being due to ossification in nearly their whole length. A spasm of these arteries occurred with great increase of the intra-cardiac pressure. This view he expressed in a letter to Dr. Heberden, and with touching kindness desired him not to publish this opinion, lest it should affect the health of John Hunter, the anatomist, who suffered from angina pectoris.

It is now generally conceded that anatomical changes in the aorta, the coronary arteries, and myocardium are almost constant in this affection, and that arterio-sclerosis, hypertrophy of the heart, increased arterial tension, and aortic insufficiency are often present.

Prognosis.—This is, from the nature of the disease, grave. Amendment may for a time ensue, but sooner or later death occurs in the course of a paroxysm.

Treatment.—There can be little doubt that the inhalation of nitrite of amyl is the best remedy for the paroxysm of angina pectoris. The inhalation of two to three drops relaxes the increased arterial tension, and in a few seconds causes the face to flush and the head to feel full. The heart seems to give one strong beat, and from a condition of perfect agony there may be, in a moment, complete repose. The instantaneous relief experienced by its use has induced many patients to carry about with them glass tubes of nitrite of amyl,—each containing 4 minims,—and at the slightest warning of an attack, to break one, and inhale the amyl sprinkled on a handkerchief. Comparative freedom from attack is thus enjoyed, and walking exercise may be cautiously tried.

While nitrite of amyl is probably the readiest way of cutting short a paroxysm, yet for preventing the recurrence of seizures nitro-glycerin is the best remedy. In beginning the treatment it is advisable to commence with 1 minim of liquor trinitrini, and gradually to increase the dose to 10 minims regularly every three hours, or to take in similarly increasing doses tabellæ trinitrini. Thus one tablet thrice daily, then two, then three, four, five. Judge by the effects produced, and do not increase the dose if the patient complains of flushing or headache. In many cases after a time the patient is able to leave off taking the remedy, and may walk with ease on level ground. While this, happily, is often the result of the nitro-glycerin treatment, yet it is to be remembered that in this disease rest is an essential therapeutic agent. And cardiac rest is best obtained here by a tranquil life and by using moderately, if not abstaining from, alcohol and tobacco, and removing all constriction in dress from the neck and abdomen. Common-sense and prudence should prevent a patient courting a paroxysm by walking against the wind, or struggling to ascend a mountain. It is further of paramount importance in carrying out this treatment that the patient should rest a little after each meal, and that there should be a daily action of the bowels. If this action be secured by proper diet there is no necessity for aperient medicines, but if an aperient has to be given, F. 28*a* is serviceable. If there be sluggishness of the liver it is well to give once a week a pill containing mercury and podophyllum (F. 27*a*). Other remedies suggested are nitrite of sodium or iodide of potassium, 20 grains of which may be given thrice daily for several months, omitting the medicine for about ten days in each month. The iodide influences the arteriosclerosis, and in some instances this treatment is beneficial. Erythrol tetranitrate is very useful in ½ to 1 grain doses.

Cardiac Pain.—Functional pain of the heart sometimes creates great anxiety on the part of the patient. The usual site is a little outside the nipple, and the pain is described as being sharp and cutting or dull and heavy. It may radiate over the side of the chest to the neck, the axilla, and left arm, and it is generally paroxysmal in character. Dr. Walshe described a cardiac pain which occurs when the patient bends forward as in pulling on his boots. The explanation of this circumstance is probably afforded by the upward pressure on the heart through the diaphragm, or it may be regarded as a form of angina pectoris.

Irritable Heart.—This condition is sometimes seen in young recruits, or in civilians who go into active volunteer service without previous training. The weight of the accoutrements is found to be too heavy, and there is a sharp sudden pain in the cardiac region, with palpitation, dyspnœa, and increased frequency of the pulse. The distress is at times so great that men have to discontinue drill, or if on a march, have to drop out of the ranks. Most of these cases yield to rest and regulation of the diet—abstaining especially from excess in tea, tobacco, or alcohol, and all forms of excitement.

In other cases it seems not so easily conquered, and gives rise to cardiac hypertrophy.

Palpitation of the Heart.—There are few sensations better known, and which create at the same time more anxiety, than that to which the term "palpitation" is popularly applied. In a state of health, and even in many forms of disease, the natural cardiac movements take place imperceptibly. When they are, from any cause, markedly increased and perceptible to the individual, he is said to have palpitation; which again, if sharp and strong, is termed *throbbing;* if soft and feeble, *fluttering*. As a matter of practice, a distinction must be drawn between *permanent* and *occasional* palpitation. The former almost always accompanies organic disease, but more frequently the latter is merely the evidence of nervous and sympathetic disturbance; and to the causes of this attention will now be directed.

1. Strong emotions of joy or sorrow notably influence the actions of the heart, and from these causes palpitation is frequent. Palpitation is often noticed in persons of an irritable disposition, and is observed in such conditions as chlorosis or hysteria.

2. Palpitation may be the result of a full habit of body. Over-distension of the cavities results, and when exercise by such a person is taken, palpitation becomes a prominent feature, through increased velocity of the blood.

3. Palpitation may arise in males from indigestion, constipation, smoking, strong tea, or alcohol; and in chlorotic females when liquid in any form is taken.

4. Not infrequently palpitation is simply the evidence of a system exhausted by over-study, by mental anxiety, by want of sleep, and by lack of rest or recreation.

Diagnosis.—All the circumstances mentioned must be considered in establishing a diagnosis between palpitation and organic lesion of the heart, as hypertrophy. In both there are violent movements of the organ against the walls of the chest. But in simple palpitation the impulse is confined to the proper region of the heart, and does not extend to the back nor to the right side. It is also unaccompanied by lividity of the lips or œdema of the limbs. If the complaint occurs in young women the pale bloodless aspect of the countenance will aid, with accurate percussion of the cardiac region, in settling the nature of the disease.

Treatment.—In cardiac pain or in irritable heart the benefit from the use of digitalis is marked. Other remedies which may be of service are bromide of potassium, spiritus ætheris compositus, and in females of a hysterical condition asafœtida and valerian (F. 14). When immediate relief is necessary, from depression, irregularity, and intermittence of the pulse, then the quickest and the best remedy is a tablespoonful of brandy. When the excitement is thus relieved, then digitalis regularly administered will be found to steady the heart's action; and when there is intermittence of the pulse, belladonna or atropine is useful.

In palpitation arising from such various and even distinctly opposite causes as have been mentioned, the particular circumstances of each case must be met by appropriate measures. When plethora exists, then a low diet, cathartics, and a course of saline waters, as at Kissingen, Homburg, or Marienbad, are useful. When, on the other hand, the palpitation is an evidence of weakness, then tonic treatment, in the broad meaning of the term, is necessary. After the bowels have been acted on by a warm aperient, such as the compound decoction of aloes, the general habit is to be strengthened by quinine and iron, by nourishing diet, by exercise in the open air, and by cheerful amusements. In such cases the bracing atmosphere of St. Moritz, Tarasp, or other Swiss health-resorts at high altitudes is very valuable. The habit of excessive smoking, or drinking strong tea or stimulants, must be moderated, and in some cases altogether abandoned. When the palpitation is very severe, Schroetter recommends iced cloths, and the hypodermic injection of morphine in the cardiac region.

DISEASES OF THE BLOOD-VESSELS

DISEASES OF THE ARTERIES

Diseases of the arteries may be acute or chronic.

Acute Arteritis.—Though acute idiopathic arteritis does not exist, yet inflammation of an artery may be produced by an injury; by the formation of a thrombus, or impaction of an embolus; or by extension from surrounding parts. In the latter case, though the outer arterial coat is first affected, yet, if the inflammatory process goes on, it may extend to the inner coat and produce thrombosis.

Chronic Endarteritis.—Chronic endarteritis chiefly affects the deeper layers of the internal coat, and arises from mechanical strain or syphilis or senile changes. Any strain which raises the blood-pressure in heart or kidney disease may initiate changes of the larger arteries termed "chronic endarteritis" or "atheroma." Syphilis occasions endarteritis with thickening of the artery and diminution of its calibre.

Atheroma, attacking the larger vessels of the trunk and limbs, and those at the base of the brain, leads to serious issues. The elasticity of the vessel is impaired, and imperfect nutrition of the parts supplied by it is produced. Three stages are recognised:—

1*st*, In the first stage grayish patches are observed when the vessel is slit open. They appear to be on the surface, but really are situated between the tunica interna and the tunica media. In consistence they are semi-cartilaginous, and are the result of an inflammatory change producing a proliferation of cellular elements.

2*nd*, In the second stage, fatty degeneration of the cellular elements has taken place, and the diseased patch is now a yellowish pasty mass. Its resemblance to meal led to the designation "atheroma," from ἀθήρη, meal. From the pasty stage there are two terminations:—(*a*) the endothelium may give way, leaving an excavation, whose floor is formed by the middle and external coats of the artery; (*b*) in other instances, instead of an excavation, there is a hard calcific deposit which may be termed

The 3*rd* stage of atheroma. Bony plates without the minute structure of bone are observed at intervals on the arteries, and sharp spiculæ project into the interior of the vessels. In the aorta these bony plates may be seen in sizes varying from an inch to half an inch long ; and in the smaller arteries the calcific matter forms a distinct ring round the vessel. Sometimes when the pasty changes are washed away, the blood exudes into the substance of the middle coat of the artery and forms a *dissecting aneurysm;* or when an atheromatous ulcer develops, the vessel is much weakened at this spot and gives way, and so a *sacculated* aneurysm, or even rupture, occurs "if the external coats have not been much thickened by the formation of inflammatory tissue in them."

Diagnosis.—The disease can hardly be suspected before middle life, and though the feel of the radial pulse may, to the inexperienced, give the idea of a strong circulation by its fulness and rigidity, this impression is corrected by a sphygmographic tracing, which reveals in atheroma the up-stroke vertical and the summit of the tracing extended (see p. 214).

Treatment.—Treatment is mainly preventive. Should an atheromatous condition be suspected it must be our effort to prevent any cause operating so as to produce a hasty termination. Thus alcohol must be avoided, venereal excesses countermanded, prolonged and exciting muscular efforts forbidden. In the case of the brain all things should be excluded which may produce congestion, as mental effort or sleeplessness. In the case of the heart any condition should be guarded against which leads to distension of the right ventricle, and imposes an obstacle to the return of blood, as in strains which involve holding in the breath.

PERIARTERITIS.—This is a term applied by Charcot and Bouchard to inflammation of the perivascular sheath, which, spreading from without inwards, ultimately embraces all the coats of the vessels, giving rise to miliary aneurysms. These aneurysms, and not atheromatous disease, are stated to originate cerebral hæmorrhage.

FATTY DEGENERATION.—This condition is rare. When it does occur, velvety spots are observed on the internal surface of the artery affected. Erosion follows, which leads to the rupture of the middle and external coats.

CALCIFICATION OR PRIMARY CALCAREOUS DEGENERATION.

—Carbonate and phosphate of lime are here deposited in the middle coat of those vessels in which muscular fibre is abundant. It is a senile change, rarely seen, and affects the superficial vessels and arteries of the brain.

ARTERIO-CAPILLARY FIBROSIS is, according to Sir William Gull and Dr. Sutton, a disease of the small arteries, leading to hypertrophy of their coats, and attendant on the cirrhotic form of kidney disease. A diversity of opinion exists as to which coat of the arteries the hypertrophy attacks. Gull and Sutton believe that the external coat is the seat of fibroid thickening, and they further state that this is not caused by the coexisting disease of the kidneys, but that both are parts of a general diseased process. Dr. George Johnson, on the other hand, considers that hypertrophy attacks especially the muscular coats of all the tunics of the small arteries, and is a direct result of the obstruction which impure blood invariably meets with in the capillaries in the form of Bright's disease mentioned. More recent observations have shown that all three coats are thickened, although sometimes the thickening predominates in one or other. The hypertrophy of the middle coat may in some cases be succeeded by atrophy.

ANEURYSM.—Atheromatous or other morbid changes lead to dilatation and aneurysm. In some cases the aneurysm is observed where disease has sapped the inner coat, and afforded a pouch for the dilatation of the vessel. At other times the dilatation does not occur there, but at a spot nearer to the heart.

Gummatous disease is referred to at p. 115.

ALBUMINOID OR LARDACEOUS DISEASE.—This condition is observed in the vessels of the kidney, the liver, and the spleen, but not in the larger arteries of the system.

Following on deficient innervation, DILATATION AND CONTRACTION OF ARTERIES are sometimes seen without any degeneration of their coats. In the brains of the insane are detected alterations in the arteries, which possibly result from obstruction to their ultimate ramifications.

THORACIC ANEURYSM

Those dilatations which are termed "aneurysms" affect in some cases the whole of the artery for a certain distance, and in others only a portion of its circumference, and they may be cylindrical, spindle-shaped, or sacculated. In size they may vary from that of a pin-head to that of a man's head, and their walls are almost constantly formed by the diseased arterial coats. Recent investigations (Coats and Auld) have shown that atheroma is usually the starting-point of aneurysm. Opposite the atheroma, the middle coat atrophies, and ere the aneurysm has attained the size of a small pea, this coat has entirely disappeared. In addition to atrophy, frequent ruptures of the middle coat are found. By a compensatory process, however, new tissue is formed, both filling the ruptures and taking the place of the wasted media. Sometimes there is much inflammatory action in the diseased wall. Hence the wall of an aneurysm is formed of intima and tunica externa, and newly formed connective tissue. The cavity of an aneurysm rarely contains blood in a fluid condition only; usually there is more or less of a fibrinous coagulum deposited in layers over the lining membrane, and sometimes, by this coagulum becoming converted into fibrous tissue, the sac may be filled up and obliterated.

Unless due directly to mechanical injury, aneurysms are of most frequent occurrence in middle and advanced life; before the twentieth year aneurysms of the large arteries are very rare. They are more frequent in men than in women, and a laborious occupation or violent athletic exercise tends to their development. The disease is comparatively rare, and its frequency varies in different countries. It is most common in England. In Germany it is less common than in France, and in Italy it is very rare.

Sites. — There are three chief situations for thoracic aneurysms, which are usually confined to the aortic arterial system, and are seldom observed in the pulmonary artery, viz. the ascending portion of the aortic arch, the transverse part of the arch, and the roots of the large vessels arising from the arch. Most frequently they spring from the ascending arch, and from the convexity rather than the concavity.

Aneurysms of the arch embraced by pericardium are always small in size, and are usually associated or confounded with simple aortic valvular disease. When the aneurysm is situated beyond the pericardium, it frequently attains a very large size, displacing the lung outwards, especially on the right side, and coming in contact anteriorly with the thoracic wall, where it may ultimately form a visible pulsating tumour. In the interior of the chest it presses on the right lung, and may compress the descending vena cava, and involve the right pneumogastric nerve. An aneurysm in this situation is liable to open either externally or into the pericardium or the right pleura, or the lung itself; an aneurysm of the transverse arch springing from its convex portion spreads upwards and to the left, pressing upon the manubrium sterni, the left clavicle, and the left upper ribs. A tumour is thus formed in the region mentioned, which sometimes rises from the sternum into the root of the neck. If it springs from the posterior surface of the transverse portion of the arch, its course is often latent.

Aneurysms of the descending part of the arch are rarely to be detected until they have attained a large size, although their presence may be suspected if we find dulness, pulsation, murmur, absence of respiration over a limited area, and dull aching or burning pain over the vertebræ.

The exact anatomical relations of thoracic aneurysms of moderate size may thus be summarised :—

1. Aneurysm of the ascending aorta (the most common variety) forms a pulsating tumour in the second right intercostal space near the sternum.

2. Aneurysm of the transverse part of the aortic arch is situated at the level of the manubrium sterni, but reaches to a variable distance to the left of that bone, according to the size of the swelling.

3. Aneurysm of the descending aorta renders prominent a part of the left posterior surface of the thorax in the neighbourhood of the lower dorsal vertebræ.

General Symptoms.—When the tumour can be detected externally, the diagnosis is easy, but if this is not the case the symptoms are obscure. Generally speaking, an aneurysmal patient suffers from cough, dyspnœa, difficulty in swallowing, and pain about the chest and back. The pain is usually dull and heavy, but occasionally it occurs in paroxysms, and is boring and pulsating, and may be increased by mental emotion. With the pain there is often a feeling of tightness of the chest simulating that of angina pectoris. The cough is audibly brassy in character, and attended with a suffocative feeling, by aphonia and paralysis of one or both vocal cords, if one or both recurrent laryngeal nerves are implicated; and if the tumour extends deeply backwards, so as to press on the ganglia and branches of the sympathetic, there will be permanent *contraction of the pupil* of the affected side.

The *physical signs* are dulness, "bruit," absence of respiration, or bronchial respiration from pressure on a bronchus. Again, if the transverse part of the arch be the seat, the tumour or pulsation may be felt by placing the finger deeply in the suprasternal notch. Heart murmurs and pain, or numbness of the arm or side, serve to confirm our diagnosis.

The *duration* of the disease is uncertain. In thirty cases collected by Lebert the disease lasted from one year to four years. The disease seems to make more rapid progress in young people than in old. The prognosis is necessarily very unfavourable.

For treatment, see p. 252.

ABDOMINAL ANEURYSM

Aneurysms of the abdominal aorta are more frequent above than below the cœliac axis. They are spindle-shaped or saccular (from three to six inches in mean diameter), and often of very considerable size, the contents sometimes weighing as much as ten pounds. They project from the anterior surface or sides of the artery, and tend to develop downwards and to the left more than upwards and to the right because of the liver and the diaphragm.

Symptoms.—A tumour is usually found to the left, just above the navel. On palpation a forcible pulsation is perceived a little after the apex-beat and accompanied with a thrill, and along with this thrill a murmur is heard. The pulsation is almost always single and synchronous with the radial pulse; it is limited to the tumour, and is occasionally accompanied by thrills. A murmur in the recumbent position is rarely absent; it is systolic in character, single, blowing, and prolonged. It is rarely transmitted into the vessel beyond. If the aneurysm is situated high up it cannot be palpated, and we can only perceive the pulsation communicated through contiguous parts (liver, spine, etc.) and hear the murmur similarly propagated.

Functional disturbances may also be present in a greater or less degree. The most common of these is pain in the belly and in the back, corresponding to the seat of the tumour. There may also be vomiting, diarrhœa, or constipation.

The general condition of the patient may remain unaltered for some time, or there may be progressive debility. Rupture of the aneurysm is frequent, giving rise to acute peritonitis or death from internal hæmorrhage; or sometimes an aneurysm of this kind may burst into the left pleural cavity.

Diagnosis.—Abdominal aneurysm is difficult to diagnose, for it is simulated by various conditions, as hysteria, uterine or intestinal irritation, dyspepsia, cancerous or other tumours. The leading points in abdominal aneurysm are—

1. Localised throbbing, unassociated with the general symptoms of the diseases mentioned. In these diseases the pulsation is not localised, but may extend to the main arteries of the lower limb.

2. Examination under chloroform will show whether the aorta is normal.

3. In the prone position an abdominal tumour will gravitate away from the aorta, and, although a murmur may be produced with strong pressure of the stethoscope, it does not exist when that pressure is withdrawn.

4. The fixed local pain in the back, aggravated by pressure and motion, may be simulated by spinal rheumatism, but the absence of other local signs of a tumour differentiates this from aneurysm.

Treatment.—Necropsies have shown, when a patient has died from an intercurrent disease as phthisis, that internal aneurysms are cured by the deposition of layers of coagulated fibrin within the sac. Fibrin so deposited, organises and brings about obliteration of the sac by its contraction. The indications for treatment, therefore, are to lessen the force and frequency of the heart's beat, to diminish arterial tension, and to increase the coagulability of the blood in the sac. To accomplish these ends, a spare dry diet, and rest, bodily and mental, are of primary importance. Tufnell's treatment limits the amount of solid food to 10 ounces daily, which may consist of bread and butter for breakfast and supper, and well-cooked meat and potatoes for dinner. The quantity of liquid is limited to 8 ounces daily, preference being given to milk and cocoa, water and light claret. Suitable aperients or enemata are required to relieve the tendency to constipation. The patient meanwhile is kept in bed for a period varying from three to six months, and on no account is allowed to sit, even for an instant, though he may be permitted with due care to turn occasionally from side to side. This treatment is commendable, as it so quiets the circulation that spontaneous coagulation may take place in the sac. But experience has shown that in practice it cannot be carried on without modifications, and now a somewhat greater quantity and variety of food are permitted, while the consumption of liquids is restricted to the quantity absolutely necessary. At the same time iodide of potassium should be given in large doses, as from 20 to 30 grains thrice daily. The action of the iodide in these doses lowers the blood-pressure and so favours the internal contraction of the sac. The pulse-rate should be the guide to determine the dose in each case; if the larger doses are not well borne, then smaller ones should be given, as 15 grains thrice daily.

By the combination of Tufnell's method and treatment by iodide of potassium, amendment in certain cases follows; consolidation of the sac is induced, which is evidenced by the diminution of the area of dulness and abatement of the most prominent signs of the disease.

The hypodermic injection of ergotin in a 10-m. dose in the immediate neighbourhood of the sac has also been advocated, but this method of treatment has not succeeded. When the sac projects considerably on the surface, galvano-puncture has been tried in some cases with success. According to Ciniselli, "the mechanical action of the needles is combined with a chemical action produced by the electrolytic decomposition of water and of the salts of the blood." Two, three, or more needles, according to the extent of the sac, should be introduced, so that they shall not come in contact with each other, and they should be directed rather towards the periphery of the sac than towards the aorta, as it is of great importance to avoid the formation of a coagulum near the general blood-current. It seems best to connect the needles with the *positive* pole only, as the clot formed is firmer than with the negative pole, and to apply the latter connected with a large copper electrode to the adjacent surface. The sitting should last from ten to fifteen minutes, and the strength of the current should not exceed 10 to 20 milliampères. In some successful cases there have been as many as thirteen sittings at intervals of three to six days.

Professor W. MacEwen of Glasgow University has successfully tried a simpler and easier plan. Under strict antiseptic precautions he inserts a pin right through the sac, until it reaches the opposite wall. The pin is left here for some hours so that the movement imparted to it by the blood-current may cause it to scratch the surface of the sac. This method excites the necessary amount of irritation to produce "White Thrombi," and different parts of the sac may be acted upon by the same pin without its withdrawal.

DISEASES OF THE DIGESTIVE SYSTEM

In all diseases, as a matter of routine the tongue is necessarily examined. Thus, it may be moist or dry, its size and colour may vary, and it may be abnormally clean or covered with epithelium or "coating." Valuable indications may thus be afforded as to the disease itself, the state of the system generally, and the progress towards recovery or the reverse. It is impossible, however, by its appearance to predicate what the disease may be, though it is useful to remember that the tongue is pale in general anæmia; red as to its tip, edges, or papillæ, in subacute inflammatory stomach derangement. If covered with a thick fur, the stomach is probably affected in its mucous membrane, whereas, if it looks red, as in scarlet fever, the other parts of the gastro-intestinal tract are also involved.

The tongue may be the seat of local affections. Thus, simple ulcers, the result of gastric derangement, may form on its tip or frænum. Ulcers may be of syphilitic origin, and if so, are usually situated at the sides of the tongue and inside of the lips. Sometimes syphilis forms oval patches, without any ulceration.

Treatment.—If the local affection is the result of gastric derangement, attention to the diet and a mild purgative will generally effect a cure (F. 8); if of syphilitic origin, then the constitutional remedies for that disease must be put in force.

DISEASES OF PALATE AND FAUCES

Inflammation of the palate or fauces may occur under several forms. Thus there is a variety called "simple" or "catarrhal," commencing with bright red patches on the inside of the cheeks, and extending with considerable swelling until the whole surface may be covered. It is attended with a bad taste, furred tongue, and want of appetite. The mucous follicles, again, may be enlarged and obstructed, and when they soften and burst, as they usually do, small ulcers are left with some redness. This variety is termed "follicular." In infants, especially after some feverishness and restlessness, small yellowish-white spots on the lips, cheeks, or palate are seen. These are vesicles, which, bursting, leave small ulcerations. This form is called "aphthous." Two other varieties claim a few additional words.

Parasitic Stomatitis depends on the presence of fungus, *Saccharomyces albicans.* There are heat and pain in the mouth, and the disease is revealed by whitish-gray patches, looking like curdled milk and easily detached. It is peculiar to young infants, being known by nurses and mothers as the "thrush." Sometimes it appears in the later stages of phthisis in adults, and is a specially unfavourable symptom.

Gangrenous Stomatitis, or Cancrum Oris, is a rare but dangerous affection, attacking weakly children recovering from measles or other acute disease. The ulceration commences on the mucous membrane of the lip or cheek, and spreads to the deeper tissues, perforating the skin, destroying the jaw, and leaving a hideous excavation with rugged gangrenous edges. It is noteworthy that pain and tenderness may be slight or altogether absent.

Swelling of the cheek, intense fœtor of the breath, great salivation, and rapid prostration with a fatal termination, may accompany the local changes described.

Treatment.—In all affections of the mouth, chlorate of potassium seems beneficial, given in 2-grain to 5-grain doses to children, but increased to 20 or 30 in adults (F. 7). Borax and glycerin may be applied locally in thrush; and, in cancrum oris, the only chance for the child depends on its being put under chloroform, and having the part burnt with strong nitric acid or Pacquelin's cautery. The strength must also be supported by brandy and beef-tea, and the mouth should be freely washed with Condy's fluid or carbolic acid lotion.

Catarrhal Tonsillitis is characterised by soreness of the throat, with superficial inflammation of the tongue and tonsils. It depends on cold, and is sometimes termed "sore" or "relaxed throat." It rarely ends in suppuration, recovery being effected in three or four days.

Quinsy (*Synonym*, Suppurative Tonsillitis) is attended with fever, fœtid breath, and pain in one or both tonsils, shooting along the Eustachian tube into the ear.

The tonsil or tonsils are red and inflamed, the inflammation terminating in resolution or progressing to suppuration, with speedy recovery following the discharge of pus.

It is caused chiefly by exposure to cold, and is most common in youth.

A form of chronic tonsillitis is not uncommonly seen in young and delicate children, where the tonsils are enlarged and the voice husky, with occasional deafness.

Treatment.—The inhalation of steam and the application of hot linseed-meal poultices hasten resolution or promote suppuration. Sulphate of magnesium (F. 24) can be recommended. The bowels having been freely moved, tincture of aconite 1 minim dose along with tincture of belladonna 2 minims may be given every hour. These remedies sometimes cut short the inflammation, and the suppurative stage is not reached. Guaiacum is also said to assist the action of aconite (F. 6). In CATARRHAL TONSILLITIS a mercurial purge should be given (F. 23), followed by local applications of tannin and glycerin, or glycerin and tinct. ferri perchloridi. In chronic tonsillitis excision of part of the gland is sometimes necessary.

DISEASES OF THE STOMACH

Acute inflammation may attack the œsophagus, constituting what is termed "acute œsophagitis," and may be due to extension of simple catarrhal inflammation of other parts; to direct injury from foreign bodies, or swallowing some corrosive poison; or it may be a complication of specific fevers, or cholera, or pyæmia. It is attended with pain, more or less severe, deep in the chest in the course of the œsophagus and with painful difficulty of swallowing and the vomiting of what has been taken, probably mixed with blood or membranous casts. There are also much thirst and great general distress.

The œsophagus may be the seat of stricture, either spasmodic or real, or of cancer.

These affections are all characterised by one prominent symptom—difficulty of swallowing, with, in cancer, great pain, enlargement of the lymphatic glands, cough, and husky voice, from the pressure on the trachea or recurrent laryngeal nerves. Non-cancerous stricture is generally the result of swallowing some corrosive poison.

In attempting a diagnosis when the symptoms point to the œsophagus it is important to look to the age and sex of the patient, to the presence or not of a cancerous cachexia, to the implication of other organs, and to the knowledge as to the seat of the stricture, if there is any, conveyed by an examination by the bougie. In forming a prognosis it is to be remembered that spasmodic affections of the œsophagus, though difficult to get rid of, are not fatal; whereas every form of obstruction is unfavourable, and in cancer a fatal termination may be foretold.

Treatment can only be palliative, unless in the spasmodic stricture of young and hysterical females, when the general treatment recommended in hysteria may be adopted. In spasm, friction with a belladonna liniment, the passage of a bougie, and careful dieting are essential.

INFLAMMATION OF THE STOMACH

Synonym, GASTRITIS

Inflammation of the stomach may be either acute or chronic.

Acute inflammation again is subdivided into (1) catarrhal, (2) erythematous.

Acute catarrhal gastritis is most common in middle or advanced life, and in females more than males. Sometimes it is seen in gouty or rheumatic people, or it may appear in connection with diseases of the heart or lungs or cirrhosis of the liver. Errors of diet, as taking cheese, ice-cream, or indigestible food, may arouse acute gastritis. The chief cause is, however, alcoholic indulgence.

Acute erythematous gastritis is met with generally in children or young persons, and is sometimes called "gastric" and "remittent" fever. It is seen in some of the eruptive fevers, as scarlet fever, and in the later stages of phthisis.

Pathology.—In catarrhal gastritis the stomach is found empty and contracted. The lining membrane is covered with thin mucus, which, when removed, reveals a congested surface with numerous small hæmorrhages or superficial ulcerations. The gastric tubes, on microscopic section, are seen to be distended with large granular cells, and the solitary glands are greatly enlarged.

In erythematous gastritis, as seen in scarlet fever, the morbid appearances differ from those produced by catarrh, in the amount of mucus not being increased, and in the tubes being distended by an albuminous fluid, instead of by large granular cells.

Symptoms.—In the catarrhal form there is usually great weakness for a few days or hours, and occasionally the attack occurs suddenly. There is not generally much pain. Vomiting is always present, and constitutes a characteristic sign. The vomited material at first consists of the remains of a meal, and afterwards a thin glairy fluid is expelled with much retching. There is no appetite; bowels are confined; headache is severe. There is little increase of temperature, and the skin may be covered with perspiration.

In erythematous gastritis pain is the prominent symptom, unless the inflammation occurs with the eruptive fevers. The pain comes on after food, shoots towards the shoulders, and is increased by pressure over the stomach, while vomiting is continuous, though a little mucus is all that is brought up. Thirst is troublesome. The tongue is at first red, afterwards dry and glazed. Diarrhœa of a fœtid and unhealthy character accompanies the disease. The temperature is increased.

Diagnosis.—The vomiting may be mistaken for that which occurs with brain disease. It is distinguished from it by this, that the vomiting of brain disease is easy, and unaccompanied by nausea.

From typhoid fever it is distinguished by the rapid onset of the gastric symptoms; rapid, not gradual, rise of temperature; and absence of eruption after the first week.

Treatment.—Rest to the stomach is essential. Hence no food should be taken for twenty-four hours. Ice may be sucked to allay thirst. If there is great exhaustion give nutrient enemata; if excessive pain, morphia may be injected.

If there is evidence of indulgence in stimulants and of portal congestion, 5 grains of calomel may be placed on the tongue, and after an interval of eight hours a draught of effervescing citrate of magnesium should be given.

Vomiting is best relieved, if excessive, by iced champagne taken occasionally, or morphia.

Warm poultices are specially useful.

When food is considered necessary it must be given in the liquid form, as chicken soup or milk mixed with Vichy or Seltzer water, in small quantities and frequently repeated.

Chronic gastritis is simply a form of dyspepsia. The group of symptoms included under dyspepsia, with treatment, is referred to at p. 264.

The stomach is also the seat of albuminoid disease, fibroid thickening, gangrene, softening, and diseases of the vessels, but these are rare conditions.

ULCER OF THE STOMACH

Ulceration of the stomach occurs both in (*a*) an acute, and (*b*) a chronic form. Acute ulcer of the stomach occasionally presents itself in infectious diseases such as pyæmia, erysipelas, and typhoid fever. It may occur also in the later stages of heart disease. It is not single, for numerous small ulcers have been observed scattered over the surface of the mucous membrane, in which they appear to have commenced as hæmorrhages, the parts affected being afterwards removed, in all probability by the action of the gastric juice. The most common *indications* of an acute ulcer in cases accompanying infectious diseases are persistent vomiting of mucus, or mucus mixed with blood, or a severe hæmorrhage taking place from the stomach. Actual pain is a rare symptom. In cardiac cases, and sometimes in pyæmia, there is tenderness on pressure. Occasionally symptoms of acute peritonitis present themselves suddenly in a person who supposed himself to be in perfect health up to the time of the attack; and on post-mortem examination a small ulcer is observed, which has perforated all the coats of the stomach.

Treatment.—Treatment can only be directed to relieve any dangerous symptoms to which the ulcers may give rise. Hæmatemesis requires the use of ice and astringents, whilst peritonitis arising from perforation should be treated according to the methods recommended for that disorder.

(*b*) Chronic ulcer of the stomach, commonly termed "Gastric ulcer," is of frequent occurrence. Brinton and Welch found ulcers or cicatrices of healed ulcers in 5 per cent of all cases examined post-mortem.

Anatomical Characters and Pathology.—The *form* of the ulcer is that of a funnel. It seems punched out, and the edges may be bevelled off or thickened. The *shape* is usually circular. The size varies from that of a pin's head to one-third of the mucous membrane of the stomach. It may be of all degrees from partial removal of the mucous membrane to perforation, and it may be, as observed on post-mortem examination, either open or else partially or completely cicatrised—the relative frequency of the two conditions being about equal. Its site is markedly more frequent on the posterior than on the anterior wall of the stomach, its exact location being in four-fifths of the cases upon a surface bounded by the posterior wall, the lesser curvature, and the pyloric region. The rest of the surface of the stomach, while it is much larger, appears only to be affected in one-fifth of the cases. If situated on the anterior wall perforation more readily occurs, on account of there being no place for limiting adhesions, while if on the posterior, adhesions may take place to the pancreas, etc.; and thus, although the stomach is actually perforated, the adhesions prevent its contents passing into the peritoneal cavity. It is worthy of note that by means of adhesions a communication may be set up between the stomach and colon, and thus fæcal matters may be vomited with ease, not with difficulty, as in ordinary stercoraceous vomiting. The nearer the ulcer is to the coronary vessels, the greater the tendency to fatal hæmorrhage.

Etiology.—This ulcer, found only in the stomach or immediate neighbourhood, unattended by suppuration, and characterised by simple progressive molecular death, has suggested the explanation of its being caused by a corrosive action of the gastric juice, which could only occur under two conditions—(1) this gastric juice being either abnormally acid, or (2) the alkalinity of the wall of the stomach being abnormally diminished. These assumptions have been confirmed by the experiments of Pavy, who has found, if a certain quantity of acid is introduced into the stomach, and the circulation is left undisturbed, the stomach remains unaffected; but if with the same amount of acid the circulation is interrupted, the stomach becomes digested. If, moreover, the quantity of acid is greatly increased without interruption of the current of the blood, digestion will likewise take place.

The derangement of the circulation, so essential to the production of the ulcer, may be due to a variety of causes, all of which, according to Virchow, "act by interrupting the circulation in circumscribed portions of the wall of the stomach." Among these causes may be mentioned thrombi or emboli in diseased gastric arteries, and chronic hyperæmia of the mucous membrane.

Symptoms.—Painful intolerance of food is the chief symptom. The pain which is felt at the epigastrium varies in intensity, and appears within a quarter of an hour after food is taken, being increased by emotion or by pressure over the umbilical or dorsal regions, according to the situation of the ulcer. Vomiting of food in all stages of digestion, with or without blood, is a pretty constant symptom. The quantity of blood varies greatly, but when present in *any* quantity it is a most important sign. Constipation almost invariably accompanies gastric ulcer, and the patient has a worn-out, low-spirited aspect. Lastly, the failure of all remedies and the chronic history help us in forming our diagnosis.

The intensity of the symptoms varies more according to the position than the size of the ulcer, on account of some positions being more exposed to constant friction than others. If the ulcer be close to the pylorus, we may have stricture from spasm of the pyloric muscle, and thus the vomited matter will be in a sour and fermented state from its long retention in the stomach. Again, if the ulceration goes on to perforation, and no limiting adhesions have formed, the contents pass out of the stomach, and give rise to symptoms of acute general peritonitis.

The course of the disease is very chronic, lasting sometimes the greater part of a lifetime. It may occur at any age, tending more to cicatrisation in the old and to perforation in the young.

This chronic course runs on to one of three terminations.

1. After long suffering, sometimes with relapses, the patient gets better, owing to the ulcer cicatrising; still, great care must be observed. Recovery thus occurs in half of the cases.

2. Sudden death may occur from shock, owing to the ulcer perforating into the peritoneum, from peritonitis, or from hæmorrhage.

3. Gradual death from sheer wearing-out. In such cases amenorrhœa or phthisis may supervene.

Dietetic Treatment.—We have neither prophylactics nor specifics, and our object in treatment is to remember that we aim at cicatrisation of the ulcer by the removal of all hurtful influences which might impede the natural process of healing. The patient is therefore confined to bed, and for the first two or three days only rectal alimentation is employed. Then milk in small quantities, frequently repeated, is given by the mouth. To it may be added meat juices and soft-boiled eggs, and if these are well borne, rusks, biscuits, milk puddings, fish, and chicken may be given. Should hæmatemesis occur, we must stop all food by the mouth. The patient is only allowed to suck small lumps of ice, and an ice-bag, not too heavy, is placed on the epigastrium. Vomiting is checked by opium, and astringents, as alum or acetate of lead, may be given. In a few days we resume feeding by the mouth.

Medicinal Treatment.—In some cases where the treatment mentioned cannot be adopted, opium should be given by the mouth with the object of its acting as a gastric sedative during digestion. Collections of acid matter in the stomach may be counteracted by alkalies, or alkaline saline water. Carlsbad salts, containing the sulphate of sodium, may thus be prescribed in a teaspoonful dose with half a glass of warm water early in the morning to empty the stomach, and to cause the bowels to be moved.

The subnitrate of bismuth in 5 to 10 grain doses thrice daily has a local influence on the ulcer, and also aids the digestion. Lately bismuth has been recommended in larger doses, as 20 to 30 grains thrice daily. In excessive vomiting F. 9 can be recommended, or 1-minim doses of creosote with $\frac{1}{4}$ grain of opium. In extreme hæmatemesis, when ice or gallic acid fails to give relief, then the injectio ergotæ hypodermica must be used. For perforation the treatment is immediate laparotomy.

DYSPEPSIA

The stomach is the natural receptacle of the food we eat and the liquid we drink. It starts on equal terms with other organs, but its powers of endurance are tried more than those of any other organ. Into it are thrown the most heterogeneous compounds, and it is expected to do its duty satisfactorily, whether we lead the life of an anchorite or of an epicure; or if we go to neither of these two extremes, if we eat neither too plainly nor too abundantly, we may yet try its staying powers by the rapidity with which we swallow our food, or the length of time we allow to elapse between meals.

An organ tried so much naturally rebels, gets out of gear, and sooner or later dyspepsia or indigestion supervenes, and the whole body sympathises with its ailments. The mind becomes clouded and the temper peevish, bodily vigour is impaired, and life is rendered not a pleasant holiday, but a sour and angry fact. Dyspepsia has many symptoms, and a brief consideration will be given to the most prominent of these, and how they may be met.

Want of Appetite may depend on mental causes, as joy, anger, or anxiety, or it may appear without any apparent cause. Common-sense must dictate how to deal with the former causes, and, for the latter, an acid or a bitter infusion may be employed (F. 10), or orexin hydrochloride 5 or 6 grains, not in a pilular form, but given in water with meals.

Nausea and Vomiting.—Nausea after taking food, which may or may not terminate in vomiting, sometimes attracts attention—the vomited matter being sour at first, but, if the vomiting be long continued, mixed with bile. To soothe this irritability there are special therapeutic remedies, such as creosote and hydrocyanic acid (F. 9), in addition to careful regulation of the quantity and quality of food.

Flatulence and Belching.—Flatulence, popularly termed "the wind on the stomach," may be due to many causes, prominent among which is the fermentation of food or the want of an accustomed meal at a certain hour.

It is often relieved by warm carminatives (F. 13), and by a regulated interval between meals. If it immediately follows the taking of food, pepsin and rhubarb are useful (F. 91).

Should belching be accompanied by a rotten-egg flavour, showing the evolution of sulphuretted hydrogen gas, creosote and charcoal biscuits should be ordered; if there is also great acidity, prescribe sp. ammon. aromat., liq. pot., and tinct. rhei (F. 73).

Pain.—Cullen describes two kinds, cardialgia or heartburn, and gastrodynia or cramp or spasm of the stomach. For simple heartburn black sugar or eating an apple are popular but good remedies; or we may give a draught of liquor of bismuth and spirit of chloroform, or F. 11. Gastrodynia Dr. Abercrombie thought was due to a loaded colon, and hence ordered a brisk purgative, followed by carminatives (F. 25, 13). A mustard poultice often gives relief.

Water Brash, *Pyrosis*, attended with the eructation of thin tasteless watery fluid, may be connected with organic disease of the stomach, or with the taking of some particular kind of food, as oatmeal. If we treat it simply as a symptom, pulv. kino co. can be recommended combined with a watery purgative in the morning, as Friedrichshall or Püllna.

In 1842 John Goodsir discovered in the vomited matters of certain patients small flat bodies having a rectangular outline and a somewhat oblong shape, and resembling little packets tied lengthwise and across with a string; hence he called them sarcinæ (bundles). They are the cells of a fungus, and are evidence that the stomach is prevented by disease from completely emptying itself. Sulphite of sodium given in 10 to 20 grain doses gives relief, by the sulphurous acid being set free in the stomach ; lavage or washing out the stomach is also beneficial (see p. 269).

Dyspeptics constantly ask, What shall we eat, and what shall we drink? and, although no fixed rules can be laid down, the following points are of practical importance.

Mutton is probably the most digestible of all animal foods, while all cured meats — ham, tongue, and sausage — are indigestible. Animal food is more easily digested than vegetable. While man's organs of digestion ally him more to the carnivorous than the graminivorous race, yet a mixture of animal and vegetable food suits the stomach best. Do not press prohibitions as to food too far, else you will convert the dyspeptic into a confirmed hypochondriac.

As a rule, there should not be more than three meals a day. The principal meal, dinner, should be separated from the others by an equal number of hours, and at it freshly roasted mutton, poultry, beef, or game should be eaten. Salted meats, pork, or veal are not suitable for a weak digestion. Of vegetables, spinach, French beans, young peas, and vegetable marrow may be taken in moderation, or if vegetables disagree, then rice well boiled and dry should supply their place. Bread should be taken stale or toasted. Light farinaceous puddings agree well, but pastry in any form should be avoided. The patient should never eat so as fully to satisfy the cravings of nature, but should rise from the table with an appetite. Wines, with the exception of champagne, do not promote digestion, and should not be ordered to a dyspeptic patient; the usual practice with regard to stimulants is to limit their use to a tablespoonful of brandy or whisky in half a tumbler of Seltzer or Apollinaris water. While these general rules are thus laid down, it is to be remembered that the idiosyncrasies of each individual case must be duly considered in regulating the dietary of the dyspeptic.

DILATATION OF THE STOMACH

An acute and a chronic form of dilatation of the stomach are recognised.

The acute form is very rare, only a few cases having been reported, and these only during the last few years.

Dr. Fagge states that the diagnostic points of this affection are :—

1. A rapidly increasing, unsymmetrical distension of the abdomen—the left hypochondrium being full while the right is comparatively flattened.
2. The existence of a surface-marking descending obliquely towards the umbilicus from the left hypochondrium, and corresponding with the dragged-down lesser curvature of the stomach, this line appearing to descend with inspiration.
3. The presence of fluctuation in the lower part of the abdomen.
4. The occurrence of splashing when the lower part of the abdomen is manipulated.
5. The presence of a uniformly tympanitic note over a large part of the distended region when the patient lies flat on his back.

Treatment.—Empty the distended stomach with the stomach-pump, and sustain life by nutrient enemata.

Chronic Dilatation.—A moderate amount of dilatation is a common accompaniment of chronic gastritis and of atonic dyspepsia, as in both of these conditions there is often a diminution of the contractile power of the muscular coat. The cases in which there is extreme dilatation are generally the result of an obstruction at the pyloric orifice, retarding the passage of food into the intestines, and this may arise from various causes. (1*st*) Stricture of the pyloric orifice the result of cancer, either as a hard scirrhous ring or projection of a fungoid growth; (2*nd*) there may be stricture, non-malignant, due to fibroid thickening; or, in some rare cases, thickening of the mucous membrane alone may cause contraction; (3*rd*) the cicatrisation of a simple ulcer near the pylorus may cause obstruction; (4*th*) tumours, generally malignant, may press on the opening; (5*th*) the stomach may be displaced by adhesions, and the pyloric orifice dragged downwards, till dilatation of the organ results; (6*th*) the stomach may be dilated by paralysis of the muscular coat due to injury of the splanchnic nerves.

Anatomical Characters.—When the abdomen is opened in a case of death from dilatation of the stomach, the organ is found to be greatly enlarged, and seems to fill the whole cavity. The greater curvature may lie below the pubes. The position of the pylorus varies according to the disease affecting it. It may either be tied down by adhesions to its original site, or dragged from its natural position by the weight of the organ. When laid open the stomach seems filled with dark-coloured frothy fluid. The rugæ are effaced by constant stretching, and the mucous membrane is more or less softened by the post-mortem changes effected by the acid contents. Microscopically the tubes may be found widely separated or altogether destroyed; the gastric cells may be large and fatty; or the muscular structure may be, notably at the pylorus, in a state of hypertrophy.

Symptoms.—The symptoms are gradual. There is usually a history of long digestive derangement, acid eructation, and vomiting. This latter symptom is very constant, but the vomiting does not occur, as in gastric ulcer, soon after taking food, but at long intervals, most frequently at night or towards the morning; occasionally it is attended with hæmatemesis. The character of the vomited matters, which are brought up easily and without strain, is peculiar, of a dark-brown colour, and very acid. On standing they become covered with a scum, and a thick brown sediment settles. This sediment shows, on a microscopic examination, sarcinæ and torulæ, intermixed with food and mucus. The bowels are always constipated, the urine thick and depositing lithates. The nutrition of the patient suffers, and death takes place from exhaustion, preceded by swelling of the legs and feet.

Physical Signs.—A large extent of tympanitic sound; irregular distension of the abdomen; fulness of the left side of the abdomen and vermicular motion apparent over the organ; splashing sound; the character of the vomiting and the detection of sarcinæ. The history of the case and the age of the patient must guide the practitioner as to the cause of the dilatation.

Treatment.—When the dilatation of the stomach has been due to gastric causes, as excessive and improper food, a limited amount of food for some time will be found to be most useful. The dietetic rules then are regularity in the hours of meals, little fluid with meals, and the exclusion of all such articles of food as starch and saccharine substances. The objects in view are to avoid distension of the stomach, whether by the bulk of food and drink introduced, or by the generation of gases. When there is much pain after food, it will be found best to restrict the patient to liquid food, taken frequently and in small quantities, such as milk, meat juice, chicken jelly. But when there is not much pain, frequent small meals of easily digested solids may be allowed, consisting of soft-boiled eggs, fish, fowls, sweetbread, tripe, etc. Symptoms must be relieved as they arise by medicinal remedies. A subcutaneous injection of morphine is invaluable if there be great pain. The distressing acidity is best relieved by a combination of bismuth and magnesia, or salicylate of bismuth, and the flatulent distension by carminatives. Sulphite of sodium in a dose of 5 or 10 grains with tincture of nux vomica 10 m. should be given between meals, or sulphocarbolate of sodium in a dose of 5 grains with spirit of chloroform 20 m. and compound infusion of gentian half an ounce. Other remedies have been recommended, as carbolic acid, creosote, and perchloride of mercury.

By far the most successful mode of treatment is *lavage*, *i.e.* washing out the stomach by the stomach-pump or stomach-syphon. The latter, after a little practice, can be used easily by the patient. Debove's syphon can be recommended. It consists of a rubber tube, not less than 50 or 60 inches in length, provided with a projecting index to show at what length it should be allowed to pass down to the stomach. A glass funnel is fitted to its outer end. When the tube has passed as far as the index marked on it, the funnel is affixed to the outer end, and filled with the fluid which is to be introduced into the stomach; when the fluid has nearly disappeared, the funnel is lowered rapidly and the liquid contents of the stomach flow out into a vessel placed to receive them. The fluid used is usually some warm water containing 2 grains to the ounce of bicarbonate of sodium. If it be desirable to use an antiseptic fluid, a saturated solution of boric acid can be recommended. By lavage, we strengthen the enfeebled gastric muscular fibres, remove fermenting and stagnant gastric contents, and increase peristaltic action. In the beginning lavage may be resorted to once or twice daily, less frequently afterwards as the case improves.

CANCER OF STOMACH

The stomach is more frequently the seat of cancer than any organ of the body with the exception of the uterus. All the varieties of cancer are met with in the stomach, but the cylinder-celled epithelioma is more common than scirrhus (Welch). The ratio of males to females is about five to four. Age has an important influence in predisposing to the malady: under the age of thirty it is rare; three-fourths of all cases occur between forty and seventy years of age.

Dr. Brinton states that the pylorus was the seat of the disease in 60 per cent, the cardiac orifice being implicated in only 13 per cent. In a large number of cases there is a history of hereditary transmission.

Symptoms.—The symptoms of gastric cancer usually show themselves very insidiously. The patient complains of slight disturbances of digestion, acidity, flatulence, want of appetite, and impairment of the general health. Afterwards there follows at varying intervals nausea, and vomiting, and pain in the region of the stomach, which is aggravated by taking food. If the pylorus is involved, pain comes on some time after taking food; if the cardiac orifice be the seat, the pain, lancinating or gnawing, comes on immediately after taking food. The vomited matters may consist of food and mucus in a grayish, sour-smelling fluid; but in a considerable majority of cases, blood, altered by the secretions, is mixed with the vomited matters, "coffee-ground vomit." The stools under such circumstances present also indications of the presence of blood (melæna).

Free hydrochloric acid is usually absent from the stomach contents. The tests for the recognition of this are many. The aniline dyes possess the property of changing colour when brought into contact with a mineral acid, and this fact is made use of chiefly in the case of methyl violet. If an aqueous solution of this substance is prepared, the violet colour instantly becomes sky-blue on the addition of hydrochloric acid, even when it exists in the small proportion of 0·024 per cent. Peptones, albumoses, leucin, mucus, and chloride of sodium have the power of forming a loose combination with the acid, and completely obscuring the reaction described. The most delicate test for free hydrochloric acid consists of phloro-glucine, 2 parts; vanillin, 1 part; absolute alcohol, 30 parts. A splinter of wood soaked in this solution and heated will change to a red colour in the presence of only 0·005 per cent of free hydrochloric acid.

The most striking features of the disease are the steady and rapid loss of flesh, and the yellow cachectic appearance of the face which accompany it. In the urine indican is often present in increased quantity. The *duration* of the disease, as a rule, extends from eighteen months to two years, but in some cases it may be only six months.

Physical Signs.—The chief and most important physical sign presented by gastric cancer is the presence of a tumour. It is usually firm, hard, nodular and painful on pressure, and can be most readily detected when the pylorus or the smaller curvature is the part affected. The tumour is usually found in the epigastrium or right hypochondrium, more rarely near the umbilicus. But if a tumour be limited to the cardiac orifice, or if it involves the fundus or the posterior wall, then it may elude discovery unless it be of a large size.

Diagnosis.—The following points are of practical importance in distinguishing cancer of the stomach from simple gastric ulcer. The cachexia, the constant pain, the occurrence of middle life, and, more important than anything else, the detection of the tumour by physical signs, are characteristic of cancer; while a youthful age, the female sex, copious hæmatemesis, non-detection of cancerous elements in the vomited matter, and a paroxysmal localised pain are peculiar to gastric ulcer. Further, chronic dyspepsia or chronic gastric catarrh differs from both in its history, its longer continuance, the absence of hæmatemesis and of great emaciation, and the fact of the pain being neither persistent nor circumscribed.

Treatment can be only palliative and supporting. Food should be given in small quantities in all cases, and as cancer at the pylorus is by far the most common form, any food which tends to ferment or causes pain should not be given. Hence food should be restricted to concentrated meat solutions and foods that can be absorbed by the stomach. Washing out the stomach by means of the syphon tube is an excellent method of combating the vomiting. Pure carbolic acid gr. ii. or creosote 1 minim in a capsule after food is also useful. When the pain becomes severe, morphine $\frac{1}{8}$ of a grain is the best remedy, combined with bismuth x. grains and carbonate of sodium v. grains. Enemata are necessary to rectify the constipation, and iced water in small quantities to relieve thirst. If stimulants be required, champagne is better than any other kind of wine.

DISEASES OF THE INTESTINES

DIARRHŒA

We may state that diarrhœa is a prominent symptom in the following cases—cholera, sporadic cholera, cirrhosis of the liver, dysentery, gastric and intestinal catarrh, pulmonary tuberculosis in its late stage, and typhoid fever. Although in these diseases it forms only a part of a totality of symptoms, yet, when the discharge from the bowel is great, special treatment may be required for its relief. The character of the stools varies, and terms such as "liquid," "bilious," "mucous," or "thin mucous" are often employed to designate the different discharges from the bowels. Diarrhœa, moreover, apart from any other complaint, may occur in the dentition of children, in young persons or adults from errors of diet, and as the result of malaria or mental emotion. Sometimes it is vicarious, and dependent on the rapid suppression of discharges, or on the absorption of dropsical fluid. In all cases of diarrhœa the stools should be carefully examined, as much information can be obtained from their consistence and nature. After these remarks we shall proceed first to describe a severe form of diarrhœa which usually precedes or accompanies an epidemic of cholera, and hence it is termed Choleraic Diarrhœa (*Synonyms*, Sporadic Cholera, Cholerine). It comes on suddenly, the stools being fluid, yellowish brown, and in number averaging from four to six in the first twenty-four hours. The characteristic distinctions between it and cholera are, that the diarrhœa does not merge, as in cholera, within a few hours into collapse; neither has the countenance the PINCHED WAN LOOK, nor the voice the CROAKY SOUND, nor the radial artery the PULSELESS FEEL of true cholera. The absence of these symptoms is striking, and eases the feelings of anxiety as to any diarrhœa occurring during an epidemic of cholera. This sporadic cholera, apart from any epidemic, may be observed in children in the first two years of their life, during the summer months; and it may also, though more rarely, attack adults as the result of over-indulgence in unripe fruits, or as a consequence of fatigue and errors of diet. In children and adults there is vomiting and severe diarrhœa. The vomited matters consist partly of the food taken and partly of slimy mucus. The stools are at first fæcal, but as the disease advances they become thin, of a rice-water colour; ultimately they may be stained with blood, and prolapse of the bowel may occur from excessive straining. The prostration is great, the pulse small, the extremities cold. Dark pigmentation and sinking in below the eyes, with depression of the fontanelles, are characteristic and ominous signs. The thermometer introduced into the rectum will rise to 101° to 102°, or even to 104° F.

Treatment.—Active measures should be at once adopted, as expectant treatment may endanger life. It is first of all necessary in the case of a CHILD to put it into a warm bath at a temperature of 100° F., and to allow it to remain there for half an hour or longer. After the expiry of the time mentioned, the child should be carefully dried and placed in a bed or cradle. A large linseed poultice should be applied to the abdomen, and a powder made up of two grains of calomel and one of Dover's powder should be administered, divided in the following manner. If the child is under twelve months old, one-third should be given every four hours. If the age is above twelve months, one-half the powder should be given, and repeated in six hours. In the former case two powders may be sufficient—the administration of the third being left to the medical adviser. Before the repetition of the powders the bathing should be repeated for the same length of time.

At the end of twenty-four hours a small dose of castor oil and a few drops of tinct. camph. co. should be given.

In the Choleraic Diarrhœa of ADULTS opiates are essential, with catechu and chalk mixture, or with dilute sulphuric acid, sp. of chloroform, and peppermint water (F. 16 and F. 17), a dose of such mixtures being given after every liquid stool in a tablespoonful of brandy. Extractum hamamelidis (hazeline), tinct. chloroformi et morphinæ co. (chlorodyne), and keratin-coated carbolic acid pills can also be recommended.

Dietetic Treatment.—To adults give iced milk or gruel and soft-boiled eggs. The excessive thirst is relieved by cracked ice.

For a child not weaned breast milk is best; if weaned, then cow's milk, to which has been added lime water, and ice should be given at regular intervals. When the severity of the disease has abated, arrowroot well boiled with milk forms a pleasant change and a useful adjunct to the treatment. Trousseau recommended giving no food except raw meat grated into a pulp and mixed with powdered sugar, and this method of treating diarrhœa, especially in children, succeeds well.

Other forms of diarrhœa must be met by appropriate treatment.

1. In young persons of a robust habit no medicine may be required. The complaint wears itself out in the course of twenty-four hours, but if it extends beyond this period it is necessary to detect and obviate the cause by medicines.

2. Irritability of the bowels generally follows on any attack of diarrhœa, and it is proper to check this by an anodyne and demulcent mixture. A draught containing chalk mixture, cinnamon, and opium is useful, and should be taken after every liquid stool (F. 17).

3. If diarrhœa continues long, and is accompanied by griping pains and tenesmus, astringents are not advisable, but a purgative medicine is indispensable to dislodge the acrid fæces on which probably it depends. Thus calomel 3 grains and rhubarb 20 may be given with advantage, or half an ounce of tincture of rhubarb alone.

4. If diarrhœa is complicated with restlessness, a white tongue, and fever, the keratin-coated carbolic acid pills, referred to under typhoid fever, have a most beneficial effect. One can be given without risk every two hours, and so administered, the tongue cleans, the temperature falls, and the diarrhœa is checked.

5. In elderly people, diarrhœa, when it assumes a chronic form, is sometimes difficult to check. It is then necessary to prescribe powerful astringents, as the compound powder of kino; or a mixture containing catechu, opium, and chalk (F. 17); or a starch and opium enema; or a pill of sulphate of copper ¼ grain, with extract of hyoscyamus 1 grain.

Diet.—In these forms of diarrhœa the food should be light and easy of digestion, as gruel, rice, sago, or tapioca pudding, or chicken broth.

CONSTIPATION

Constipation is a symptom in many diseases, and as such it needs here no special comment. But we think it advisable to make a few remarks upon what is termed "habitual constipation." It is astonishing how often young females of all ranks, between the ages of fifteen and twenty, pay no attention to the action of their bowels, and appear to be rather surprised when an inquiry is made as to their state. Men of sedentary habits are usually constipated, which is often due not merely to want of exercise but to neglect of the ordinary calls of nature. Females at the middle period of life frequently suffer from constipation, which is accompanied by hæmorrhoids. In a sea-voyage, passengers, cabin or steerage, of both sexes become more or less constipated.

Symptoms.—Habitual constipation causes a coated tongue, a dull headache, impaired appetite, often flatulent distension and palpitation, and notably depression of spirits.

Owing to local pressure by the retained fæces on the vessels and nerves in the neighbourhood of the rectum and sigmoid flexure, there may be hæmorrhoids, or symptoms of sciatica, or neuralgic pains in the legs, or a complaint that the feet always feel cold. Occasionally a feverish state develops and the temperature rises to 101° or 102°.

Treatment.—1. *Diet.*—Very often a suitable diet is alone necessary. Thus brown bread, onions, stewed prunes or figs, baked apples, bananas, and other ripe fruits exercise a stimulating action on the intestinal walls and increase the bulk of the fæces. The vegetable element should supersede the animal, but not to such an extent as to cause flatulence. Exercise should be advocated to the sedentary man, and should form part of his daily routine. Young females should be told boldly and frankly of troubles which tight-lacing has in store for them. The fear of possible loss of colour in their complexion has more weight in such cases than any injunction to follow medical advice. It is always advisable for the habitually constipated person to drink, before dressing, a tumbler of warm water, and after breakfast to solicit an action of the bowels. In the case of men who do not smoke, the importance of a morning pipe or a cigar should be placed before them. In the case of females at middle age, massage of the abdominal muscles has an excellent effect.

2. *Medicinal Remedies.*—There is generally an objection to

use an enema, but, as a rule, there is no objection to use a suppository, and a glycerin suppository can be recommended. The drugs recommended are numerous, the best however is cascara sagrada. The B.P. preparation, or any preparation of this bark made in Great Britain, is infinitely inferior to those obtained from the United States, for the simple reason that only inferior barks are shipped to this country. The preparation of the liquid extract of cascara sagrada (Parke, Davies, and Co.) in a dose of 20 minims is more potent than 60 minims of our ordinary liquid extract. It should be taken in diminishing doses, thus 20 m., 15 m., 12 m., and 10 m. The latter dose should be continued for a fortnight, after which, as a rule, the further administration of the drug is not required. If constipation exists with sluggishness of the liver a pill of euonymin, gr. $\frac{1}{2}$; leptandrin, gr. $\frac{1}{2}$; podophyllum, gr. $\frac{1}{2}$; ext. hyoscyami, gr. ii. should be taken when necessary at bedtime, or an after-dinner pill of ext. nucis vomicæ, gr. $\frac{1}{10}$; ext. aloes Barb., gr. $\frac{3}{4}$; ferri sulph., gr. iiss. This latter pill may be given regularly for three or four weeks, and then gradually discontinued. Drugs which should not be recommended in habitual constipation are saline aperients. These when taken only lead to their continued use in increasing doses.

OBSTRUCTION OF THE BOWELS

When called in to a case of obstruction of the bowels it is incumbent on the part of the practitioner to investigate the cause or causes on which this depends. It is necessary first to make certain whether or not it is due to hernia, and if such should be the case to act upon the precepts laid down in surgery. But if hernia is not detected he has to consider whether it belongs to *acute* or *chronic* obstruction. These two affections have *three* symptoms common to both—viz. constipation, pain, and vomiting.

Constipation may be said to be at the root of all obstruction, and so long as the cause of this is not removed, remains unrelieved by enemata or purgatives.

Pain exists fixed and constant over the seat of the obstruction, or more or less spread over the abdomen, or paroxysmal in character and not limited to any spot.

Vomiting occurs sooner or later in all forms of obstruction. *Soon* if the obstruction is situated in the upper part of the small intestine, and if the condition is unrelieved, death will occur in the course of four or five days; *late* if the obstruction is in the large intestine, and even, if unrelieved, the end may be delayed for weeks. The vomited matters consist, first, of the contents of the stomach, and these are followed by bile-coloured fluid from the duodenum; finally of matters, down to the seat of obstruction, the smell of which is intense and fæcal. While the symptoms mentioned are common to both forms, yet there is a marked difference in the rapidity with which they are developed; for in chronic obstruction the constipation may not be complete, as occasional fæcal evacuations are passed from time to time. The vomiting is also delayed, in some cases for weeks, after the stoppage has occurred, and the pain may be absent or only paroxysmal.

Etiology of Chronic Obstruction.—Chronic obstruction may be due to the impaction of fæces in the large intestine, or to two diseased states—contraction or stricture. Contraction occurs chiefly in the small, and stricture in the large intestine. The latter condition (stricture) may be either simple or cancerous. Digital examination of the rectum in such cases sometimes gives important information, and when the finger is unable to reach the supposed seat of the obstruction, the attempt may be made to insert the whole hand when the patient is under the influence of chloroform.

Etiology of Acute Obstruction.—The causes of acute obstruction fall under four principal heads: I. Constriction or internal strangulation affecting chiefly the small intestine; II. Volvulus or twists situated generally at the cæcum or sigmoid flexure; III. Impaction of a large gallstone in the small intestine; IV. Intussusception of the small intestine.

Symptoms.—In all these forms constipation is absolute, and vomiting is an early symptom, and with these symptoms there is collapse, a condition marked by sunken face, by dark circles round the eyes, by a pulse rapid and small, by cold sweat on the limbs, and by a high-pitched or hoarse voice.

Intussusception has peculiar features, and its nature is similar to what occurs when the finger of a glove is pulled within itself. The most common invagination is ileo-cæcal,—that is, the passage of the ileum and cæcum into the colon preceded by the ileo-cæcal opening. It occurs most frequently in children, and as there is greater mobility of the colon at that age than in adult life, the invagination often in a few days makes its way through the whole colon, and appears in the rectum above the anus, through which it is even at times prolapsed. The first symptom is violent colic followed by vomiting. Next comes, through increased peristaltic action, acute diarrhœa with bloody stools. Painful tenesmus and paralysis of the sphincter of the rectum are observed later. The course of such invaginations in children is rapid, and leads to complete occlusion, death resulting in three to six days, or in a few hours from shock. In other cases, and especially in adults, separation and gangrene of the intussuscepted portions may take place gradually, and death may not occur until the second or third week; or the course may be chronic, the swelling may disappear, and, the canal of the intussuscepted portion becoming permeable, the fatal termination may be delayed, with alternate diarrhœa and constipation for a year. A more fortunate result is when, spontaneously or by suitable treatment, the invaginated portion is withdrawn into its normal position without separation, or sloughs off and is expelled.

Treatment.—In cases of intussusception of children, when the prolapsus is perceived at the rectum, it is necessary to anæsthetise the patient and attempt reduction. This is done by the hand or sponge sound, and after this reduction has been effected so far as it can be, viz. into the lowest part of the sigmoid flexure, it is followed by injections of air and water. All attempts at reduction are forbidden if there are signs of gangrene, and if the invagination is fixed and chronic. In the other forms of acute obstruction the question of treatment lies between a surgical operation and the giving of opium. The decision come to is very grave, and involves great responsibility. If a surgical operation is decided upon it should be done early, before the pain and the suffering become intense, and before collapse sets in, and, if determined upon, opium should not be given, because its action conceals the nature and progress of the case. If a surgical operation is negatived, then opium must be given freely; in the case of an adult, to the extent of 1 grain at least every three hours, or every two, according to circumstances, and according as its action is manifested. This remedy here does more than soothe pain: it arrests violent and useless peristaltic action; it favours the accumulation of liquid contents above the obstruction; and by the combination of these factors relief may be secured, and the obstruction pass away.

Previous to giving opium, and before there is any probability of gangrene having set in, a simple mode of procedure may be adopted, whereby obstruction in some cases is removed. The patient is placed on his back, with his pelvis raised, and a long stomach-pump tube inserted into the rectum as far as it will go without force. Then warm water should be slowly thrown up until the bowels become distended. When this occurs the coils of the intestine should be moved upon one another by the hand placed on the abdomen. By this method, or with air instead of water, cases have been successfully treated; and besides, from a diagnostic point of view, it is valuable, as an idea where the obstruction exists may be formed from the amount of water capable of being thrown up.

In some cases it is necessary to nourish the patient by stimulating enemata.

In the treatment of CHRONIC OBSTRUCTION a strongly-acting purgative may be wisely ordered (F. 25), or an enema may be employed, as aloes, and these means may altogether remove the obstruction if due to fæcal impactions. If dependent on cancerous stricture the time comes when no aperient remedy can afford relief, and then opium, to check peristaltic action, should be given every four hours. Belladonna aids its action, as in the form of a pill of ext. opii gr. i. and ext. belladonnæ gr. $\frac{1}{4}$.

Diet.—In acute obstruction the diet is similar to that recommended in Peritonitis, p. 283.

PERITONITIS

The peritoneum, or serous membrane lining the abdominal and pelvic cavities and investing the viscera, may suffer from acute or chronic inflammation. The *pathological* changes are precisely similar to those which occur in all serous membranes, viz. capillary congestion, redness, more or less loss of polish, and exudation resulting in a thin grayish lamina, which ultimately becomes thicker and either ribbed or villous according to position. The surfaces of the intestines are injected, and they are slightly glued together with soft yellow-gray lymph stretching from one fold of the peritoneum to another. In the pelvic cavity there is turbid fluid, in which float flakes of lymph. The effused fluid is chiefly observed in chronic cases, and tends naturally to gravitate to the lower and more dependent parts, *e.g.* into the pelvis and lumbar regions, where it may escape observation; or, if excessive, it may distend the abdominal walls. This fluid may be clear or bloody, or become rapidly or slowly purulent.

Peritonitis, even though of local origin, tends to spread until the whole of the peritoneal surface is involved; and convalescence, should it occur, is attended with absorption of the fluid, organisation of the false membrane, thickening of the peritoneal surface, and adhesions of adjacent organs. Should the fluid be purulent, it may form an external abscess or escape into the intestines.

Etiology.—Acute peritonitis is more common in females. Peritonitis may be primary after exposure to cold, as in idiopathic rheumatic cases, or it may occur in the later stages of Bright's disease, scurvy, etc. In most cases peritonitis is secondary to disease or injury of the abdomen. Thus it may follow wounds and operations, or result from direct extension of inflammation in various organs, especially the intestines and female generative organs; or it may be due to the rupture of an abscess or perforation of a neighbouring hollow viscus into the general peritoneal cavity, as in appendicitis, gastric ulcer, etc.

Bacteriology.—If due to infection from the intestine the micro-organism usually found is the bacillus coli communis, either alone or associated with other organisms, as the streptococcus. In twelve cases of primary idiopathic peritonitis Flexner found in five cases the streptococcus pyogenes. In cases of peritonitis following operation the staphylococcus aureus was more common than the streptococcus and bacillus coli communis. In some cases accompanying pneumonia the pneumococcus has been found. In cases of puerperal peritonitis the streptococcus seems to be the prevailing organism, though the gonococcus is sometimes the cause.

Symptoms.—Peritonitis, apart from any direct local cause, sets in suddenly, with acute pain distributed over the whole abdomen or confined to a circumscribed spot. This pain is increased by the slightest pressure, and patients to ease it assume a characteristic position, lying on their back with their legs drawn up and their knees bent. The aspect of the countenance is altered, with symptoms of collapse clearly depicted on it. Vomiting and hiccough are seldom absent, with tormenting thirst and coated tongue. As a rule, the bowels are constipated and the urine is scanty, and in some cases there is complete retention. The abdomen becomes more or less completely distended. The pulse is rapid—120 per minute—to the feel hard and wiry, and the temperature may rise — to 104° or 105° F. More or less effusion is developed in the course of the disease. Consciousness in the majority of cases remains intact. In fatal cases the symptoms of collapse increase, respiration becomes incomplete, and in a few days from the commencement of the attack death occurs. Recovery takes place most frequently in cases of plastic fibrinous effusion, and the symptoms which in any case indicate a change for the better are a uniform lowering of temperature, decrease of pain, cessation of vomiting, presence of fæcal evacuations, and return of sleep. In *peritonitis* from *perforation* the pain is intense, and accompanied with a feeling as if something in the abdomen had burst or given way; air enters into the peritoneal cavity, and tympanites results with attendant symptoms of collapse, fall of temperature, and death within a few hours, or at the most a couple of days. In *puerperal peritonitis* we have, in addition to the intense weakness and collapse previously mentioned, a septic infection of the blood, and the general condition known as septicæmia.

Treatment.—Absolute rest is essential in treating a case of acute peritonitis, and this rest may be obtained by maintaining the position which the patient instinctively assumes, and at the same time guarding the body, by means of a cradle, from unnecessary weight of the bed-clothes. Still further, complete rest must be given to the bowels by opium, which checks peristaltic action, and reduces the dilatation of vessels associated with acute inflammation. Begin with one grain of opium, and note its effect in an hour, when the dose should be repeated. At the end of the second hour the quantity should be *doubled*, unless symptoms of the action of opium are observed, when it may be given in the same dose, and so on, at intervals of two hours, until slight narcosis is manifested. The system should be kept under the influence of opium for ten days or a fortnight, and at the expiry of that time the action of the bowels should be solicited by an enema or castor oil. Other symptoms must be met as they occur—tympanites by a turpentine enema ; hiccough by ether, ice, or a hypodermic injection of morphine.

If the peritonitis is circumscribed and seen early, leeches should be applied to the site noted, and the bleeding encouraged for a time by hot fomentations. If due to acute perforation the question of immediate laparotomy must be considered.

In puerperal peritonitis, collapse and cardiac failure necessitate the administration of stimulants, as champagne, in large doses ; or ether may be injected subcutaneously.

Local Applications.—Warm fomentations should be used constantly, and changed when cool, and when there is much distension of the abdomen, flannel wrung out of hot water and sprinkled with turpentine gives great relief. When the tympanitic distension is very great it may be advisable to puncture the intestine with a fine trocar.

Diet.—Ice-cold milk and an occasional teaspoonful of beef-tea jelly are the best nutriments in idiopathic peritonitis. If the case is one of peritonitis from perforation, as in ulcer of the stomach, the strength should be supported by zyminised suppositories (meat), and an occasional teaspoonful of toast-water by the mouth. Not until the fourth or fifth day should a dessert-spoonful of beef-tea jelly be allowed, and about the ninth day some strong chicken soup. Little bits of ice may be permitted if the patient is cautioned to suck them very slowly.

CHRONIC PERITONITIS

Three varieties of chronic peritonitis are recognised—1. Simple. 2. Tubercular. 3. Cancerous. (1) Simple chronic peritonitis is not a rare disease. It is equally frequent in both sexes at ages varying from twenty to sixty years.

Pathology.—In well-marked cases a post-mortem examination reveals the following conditions. The peritoneal membrane is thickened, adhesions exist between different parts, the omentum is drawn up and binds the colon to the stomach. Sometimes newly-formed membranes may cause adhesions among themselves, which divide the intestines into a number of separate chambers, each containing fluid. As a rule, however, there are no adhesions, no separate chambers, but a remarkably shortened omentum.

Clinical History.—Ascites is the chief symptom. The fluid effused into the peritoneal cavity is transparent and straw-coloured, and its commencement is insidious and obscure unless, which rarely happens, chronic peritonitis follows on the acute form. In such cases a sequence of symptoms can be traced in dull persistent pains, without, in uncomplicated instances, any great accumulation of fluid. The adhesions mentioned, when existing, prevent the fluid in the peritoneum gravitating freely. It is to be noted that sometimes a friction sound can be heard by the ear or felt by the hand, which results from the respiratory movements of the abdominal walls. No ostensible cause, except acute peritonitis, seems to originate the simple chronic form, but alcoholic excesses are alleged to favour its occurrence.

TUBERCULAR PERITONITIS—*Pathology.*—The peritoneum is here covered with minute grains, most numerous upon the under surface of the diaphragm and flanks. The omentum, containing a large quantity of tubercles cheesy or gray, lies as a flattened mass, sometimes two or three inches thick, below the stomach and over the colon. The intestines also show tubercular ulcers, and the pleuræ and the pericardium contain a considerable quantity of fluid.

Clinical History.—Tubercular peritonitis occurs in males more often than females at ages varying from ten to fifty years, with vague and obscure symptoms of want of health, loss of flesh, and diarrhœa, before any effusion is observed in the peritoneum. When it attacks children, between the ages of two and ten, the tuberculosis involves not merely the peritoneum, but simultaneously also the intestines, the liver, and the mesenteric glands, and may subsequently spread to the lungs, pleuræ, and meninges. In seven cases out of nine it does not go beyond the abdomen. In fully-developed cases the symptoms are characteristic. The body is thin and wasted, the appetite capricious, the bowels relaxed, the motions sour-smelling; THE ABDOMEN IS TENSE AND SWOLLEN, WITH VEINS MARKEDLY VISIBLE. The accompanying fever is of an intermittent character.

Prognosis.—If the tubercular peritonitis is *primary* the exudation may be absorbed, and recovery take place; but in most cases extension occurs, and tubercular peritonitis proves fatal in a few months.

Treatment.—In *simple chronic peritonitis* of adults or children recovery may occasionally ensue, if there are no lesions of other parts. To aid this a flannel bandage smeared with mercurial ointment should be applied round the abdomen, to promote absorption, and syrup of the iodide of iron given internally with good nourishing food. In the *tubercular* form, we must trust to the remedies employed in other tubercular affections, as the syrup of the hypophosphates, cod-liver oil, with strengthening diet and suitable hygiene and climate. Iodide of potassium seems to be of some use. Simple laparotomy has in some cases resulted in cure.

CANCEROUS PERITONITIS—*Pathology.*—On the surface of the peritoneum are observed a large number of round or flattened granules, sometimes aggregated, sometimes single. From these, small processes are sent out, which, contracting, drag neighbouring parts of the serous membranes towards them. Thus the omentum is drawn up and lies across the abdomen, below the stomach, as a firm, solid mass. Cancerous peritonitis is rarely primary, but is secondary to malignant disease of other viscera, notably of the stomach of either sex or of the uterus in females. Below the age of thirty this disease is rare. It occurs more frequently in women than men, between fifty and sixty.

Clinical History.—In the majority of cases there is ascites, and the indurated omentum can be detected by palpation; occasionally there is a hard mass of the skin and other tissues round the umbilicus, and in a few cases there is *no ascites*, but only a visible increase of the size of the abdomen. In such cases the carcinomatous growth has undergone colloid degeneration.

Treatment.—This can only be palliative, relieving pain by narcotics and providing for easy digestion by suitable diet and aperients.

APPENDICITIS.—The term "appendicitis" has now come into general use for the inflammatory conditions in the right iliac fossa, which were formerly named Typhlitis and Perityphlitis. The change of name has arisen from a more exact knowledge of the pathology of the disease, which shows that in the vast majority of cases the inflammatory process has as its starting-point some change in the vermiform appendix. These changes may consist of fæcal concretions resembling date and cherry stones and decomposition of retained secretion. In other cases ulceration may follow retention of foreign bodies as pins and bits of bone. Distortion of the appendix from adhesions contorting it, and its fixation behind the cæcum, also contribute to disable it from ridding itself of its contents, and so promote further inflammatory changes. Appendicitis is a disease of young persons. More than fifty per cent occur before the twentieth year. In the severe form it is much more common in males than in females, and the tendency of the disease in a mild form to recur is remarkable. The *General Symptoms* are vomiting, fever, ranging in the early stage from 100° to 103° F., quick pulse, tongue coated with yellowish fur, constipation (rarely diarrhœa). The local sign at first is pain, which may be referred to the abdomen generally, or perhaps specially to the umbilical or cæcal region. With the pain, which becomes paroxysmal and often radiating to the testis, pudendum, thigh, or bladder, there is considerable tenderness and muscular rigidity, which may be distinctly limited to the right iliac region, and thereby becomes an important factor in the diagnosis. Other symptoms of localised peritonitis quickly supervene; the abdomen becomes distended and tympanitic, and occasionally, if the tenderness does not prevent, a slightly increased resistance or tumour, not more than two or three inches square, is detected over the cæcum. The temperature rises to 103° to 104°. The pulse is frequent and thready, respirations are quickened, and the aspect of the patient betokens serious illness. Vomiting becomes more frequent and is not followed by any sensation of relief. M'Burney has called attention to a sign which is now usually present, viz. a localised point of tenderness on deep pressure, situated from one and a half to two inches from the anterior superior spine of the ilium on a line drawn between this point and the navel. The patient may remain in much the same state for two or three days, when the pain and tenderness spread over the abdomen, and evidence of general peritonitis exists. The patient may succumb within the next few days, though recovery at this stage is not quite unknown, or the inflammation may assume a suppurative character, leading to the formation of a large quantity of pus encysted within the peritoneal cavity in the cæcal region. The abscess thus formed may extend and burst through the anterior abdominal parietes, or enter the cæcum, or the peritoneal cavity, or occasionally the thorax, the rectum, or the bladder.

This description of the disease applies to severe cases, but another class of cases—fortunately the most numerous—is much less severe in character, more prolonged in duration, and generally recover. The patients then are more frequently women than men, and there is usually a history of prolonged constipation. The seat of the affection and the prominence of the local symptoms are characteristic of such cases. There are also general febrile symptoms, but the temperature rarely exceeds 103° F. The duration of these cases is very uncertain, and much depends on their treatment; some last but a few days, others may continue in varying severity for two or three weeks. In a small proportion of them a circumscribed abscess is formed, but the greater majority end in resolution and complete cure.

Treatment.—The treatment differs according to the severity of the case, and may conveniently be considered according as operative interference is or is not called for. In the less severe cases rest in bed and the recumbent position is absolutely necessary, but recovery with judicious treatment may be expected without an operation. This treatment consists in the employment of means to remove the contents of the cæcum, together with such an amount of sedative remedies as will serve to keep the parts concerned as quiet as is consistent with the necessary evacuations. To meet the *first* indication the bowels should be moved by an enema—15 to 20 ounces of plain water, or soap and water, once daily. To meet the *second* indication it is advisable to give occasional small doses of opium gr. $\frac{1}{2}$ to 1 gr. by the mouth. Leeches applied over the painful spot give great relief, or warm fomentations, applied after the surface has been painted with extract of belladonna and glycerin. The *diet* should be restricted in amount as much as possible; there is usually want of appetite, and abstinence from food is beneficial; occasional teaspoonfuls of meat juice and a few ounces of peptonised milk are sufficient as a rule, and stimulants are not needed. To prevent any relapse it cannot be too strongly insisted on that the patient must be kept in bed for some days after cessation of all symptoms.

In dealing with severe cases the general measures already described are necessary, but if the acute symptoms do not subside in twenty-four to thirty-six hours prompt *operative procedure* will offer the best prospects.

INTESTINAL WORMS

Of the different intestinal worms which inhabit the human body there are two great varieties—the hollow worms and the solid worms. In the first class we find three species of tænia, the most common being the *Tœnia solium.* Its length varies from two to ten yards or more, and its habitat is the small intestine. It consists essentially of a head and segments. The head is about as large as a small pin's head flattened, with a double circle of hooks, around which are four suckers or mouths by which it attaches itself to the intestine. The segments, joints, or *proglottides* are rectangular, and possess male and female organs opening into a common aperture. The fertilised ova develop in the uterus, and when ripe contain embryos with six boring spines. The joints are at first more broad than long, but as they increase in distance from the head the worm becomes broader and the segments become longer. The *Cysticercus cellulosœ*, a parasite chiefly resident in pigs, seems to be the parent of the *Tœnia solium* in man, and from uncooked or improperly cooked pork the tapeworm is developed in the human body. How does the tapeworm develop in the human body? The answer to this inquiry and explanation of the statement preceding it are as follows:—Segments containing abundant ripe ova are passed per anum and scattered about in various ways, and so are swallowed by animals, notably pigs, oxen, and sheep, mixed with their food. In the alimentary canal of these animals the shell bursts, the embryo escapes, attaches itself to the mucous surface, works its way into the tissues, and when it reaches a suitable spot, still further develops into a head and neck with a vesicular or bladder-like appendage. In this stage the worm is termed cysticercus or bladder-worm, and may be seen in the muscles, liver, and brain of various animals. If the cysticercus thus existing in the flesh of animals is permitted to enter the alimentary canal of a human being, it becomes attached by its head, the vesicle falls off, and a succession of segments form, constituting the ordinary tapeworm.

Symptoms.—The only certain indication of the presence of the parasite is the appearance of segments in the fæces. Sometimes the victims of tænia also complain of pain in the belly, unsatisfied appetite, thirst, great depression of spirits, and itching of the anus or nose.

Varieties.—*Tœnia mediocanellata* resembles very much the former variety, but it has only a sucking apparatus on the head, and no hooks. It appears to result from the further development of a *cysticercus* infecting cattle, and owes its introduction into the system to the eating of improperly cooked beef.

The *Bothriocephalus latus*, peculiar to Switzerland, Russia, Poland, and Japan, is the largest of all the tapeworms, sometimes attaining a length of twenty-five feet and upwards, each foot containing a hundred and fifty segments or joints, and each joint having its own male and female organs. The head is club-shaped with a longitudinal slit, by which it attaches itself, but it possesses no suckers.

Treatment.—The alimentary canal must be as empty as possible, so as to allow the anthelmintic to exercise its undiluted effect upon the parasite. Hence tell the patient to take no food for eight hours, or to take a dose of castor oil three hours previous to administering the anthelmintic. Then at bedtime give 60 or 90 m. of ext. filicis liq. in an emulsion (F. 29). This should be followed by 6 to 8 drachms of castor oil in the morning. The head and segments will probably be thus forced away; if the head be not detected the same treatment must be adopted on a subsequent occasion. Tannate of pelletierine in a dose of 6 grains, or kamala in a dose of 60 grains suspended in syrup, are also effective anthelmintics. Kousso or oleum terebinthinæ are also well-known anthelmintics, and thymol in large doses has been recommended. All segments passed should be burnt.

Round Worms possess a distinct integument and an alimentary canal, with a mouth at one end and an anus at the other. The sexes are always separate. The genital pore is usually near to the anus, and in the female is about the middle of the belly.

1*st*, *Ascaris lumbricoides*, the common round worm, resembles much the common earth-worm. The female is nearly twice as large as the male. Its habitat is the small intestine, generally of badly-fed children, but from this it may creep upwards to the colon or to the stomach, and it has also been found in the nose, and in the hepatic or pancreatic ducts. Authentic records indicate that a large number of *lumbricoides* may be in the body at the same time. As a rule, however, they rarely exceed five or six. They may penetrate the intestinal wall to the peritoneum, causing an abscess near the umbilicus. The symptoms are obscure and various. Generally speaking, these are thirst, disturbed sleep, fever, depraved appetite, and itching of the nose and anus.

Treatment.—The best remedy is santonin. It should be given on an empty stomach and followed in two hours by a dose of castor oil.

2*nd*, The common thread-worm (*Oxyuris vermicularis*) is small, white, and thread-like, the female being about a third of an inch long, the male about half that length. They exist in the colon or rectum, generally in great numbers at a time, and infest children who are badly fed or are in indifferent health. The chief symptom is itching at the anus or at the nose, with bad breath and generally indifferent health. The diagnosis can easily be confirmed by observing them in the fæces.

Treatment.—Enemata of cold water, infusion of quassia, tea, or liq. calcis, repeated daily, are sufficient to kill the oxyurides, with occasional doses of hydrarg. c. cretâ. For adults, perchloride of iron, half an ounce to a pint of water, is recommended as an enema. Dr. Cobbold prefers moderate doses of aloes and asafœtida followed by mineral waters, as Püllna, Friedrichshall, and Hunyadi Janos, to other treatment in thread-worms (F. 30*a* or 30). As the general health is usually below par, it is important to supplement the vermicide treatment by tonics and nutritious food.

The whip-worm (*Trichocephalus dispar*) and the *Sclerostoma duodenale* are rarely seen in this country, although the former is sometimes observed in people who have died of typhus or of enteric fever.

PENTASTOMA (πέντε, five; and στόμα, a mouth). A genus of entozoa belonging to the family *Ascaridæ.* "The species," according to Dr. Cobbold, "two of which are liable to infest man, have a ringed or segmented body, the head being surrounded with four large hooks or claws, arranged in pairs on either side of the mouth. The *pentastoma denticulatum,* infesting the liver, gives rise to no functional disturbances. It is the larval condition of a worm that infests the nasal cavities of the dog—*pentastoma tænioides.*"

"*Pentastoma constrictum,* the other human pentastome, infests the liver and lungs. In length it measures half an inch to an inch, being also recognised by the presence of twenty-three rings. From its large size it may produce serious and even fatal symptoms. The entozoon occurs in Africa, and attacks European residents in the West Indies."

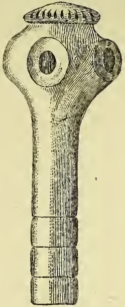
TRICHINA SPIRALIS—TRICHINOSIS.—The *Trichina spiralis* is met with in the muscular tissue in the form of a minute worm, which lies coiled up in the interior of an oval cyst, giving to the naked eye an appearance like minute white grains. These trichinæ are discovered chiefly in the flesh of pigs, and it is from the use of trichinous pork that man has become affected. Pigs again, it is supposed, obtain the disease from rats. The trichinæ cysts are dissolved by the gastric juice, and the parasites set free. Sexual maturity is developed; and the living embryos at once commence active migration, finding their way into the small vessels or lymphatics of the bowels, and thence they are conveyed over the body. In this way they enter the intestine, irritating it in their passage, getting to the intermuscular tissue of the trunk and limbs, and thence penetrating the muscular tissue, where they become encapsuled.

Symptoms.—The symptoms attending trichinosis in severe cases are somewhat typical. There is first intestinal disturbance, not unlike that of typhoid fever, with coated tongue, diarrhœa, and great prostration. If fever exists, it is but slight, and accompanied—even from the first—with a remarkable increase of perspiration. Secondly, there is also so-called "muscular lameness," followed by muscular inflam-

Pl.VII.

TAENIA SOLIUM, HEAD.

NATURAL SIZE.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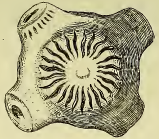
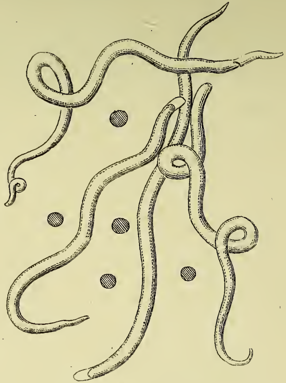
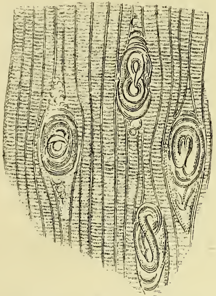
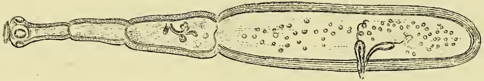
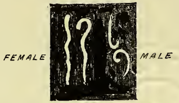

SEEN FROM ABOVE.

HOOKLET.


FILARIA SANGUINIS HOMINIS.
MUCH MAGNIFIED.


TRICHINA SPIRALIS IN MUSCLE.


TAENIA ECHINOCOCCUS.
MAGNIFIED.



OXYURIS VERMICULARIS
NAT. SIZE.

mation, pain, and tenderness not unlike rheumatism, with stiffness and rigidity over the voluntary muscles. On the seventh day the diagnosis becomes easier, for there is œdema of the face and eyelids, and this œdema is not attended with albumen in the urine, thus excluding any suspicion of the kidneys being implicated by Bright's disease. The further progress of the disease is marked by general prostration, attacks of dyspnœa, hoarseness, profuse sweats, and sleeplessness.

It is difficult to form a positive prognosis in any single case of trichinosis, for its severity, duration, and termination depend upon the number of trichinæ introduced into the system by the meat eaten, and this again varies with its mode of cooking. The less thoroughly the meat is prepared, and the less it is exposed to heat, the more severe will be the illness, and a more unfavourable prognosis will also extend to those cases where the early symptoms are violent than when they are mild and long delayed. Long-continued diarrhœa and pre-existing disease are especially unfavourable. In some cases recovery may take place in a month, in others it may require three or four. In some outbreaks the mortality is small, in others it is as high as 25 per cent, and death may result from peritonitis, pneumonia, or debility during the fourth or fifth week.

Treatment.—During the first week purgatives and anthelmintics may destroy the adult worms. When the muscles become affected we can only treat symptoms.

ANCHYLOSTOMIASIS.—The definition of Dr. Sandwith of Cairo is "an insidious wasting disease characterised by progressive anæmia, without apparent cause, and by digestive and nervous deterioration. Occurring chiefly in earth and brick labourers of *warm countries*, caused by the presence in the duodenum and jejunum of a blood-sucking rhabditic worm, occasionally proving fatal in prolonged cases, but capable of cure upon removal of *all* the parasites, and capable of prevention by scrupulous cleanliness."

Etiology.—All that is required to produce anchylostomiasis is the introduction into the stomach of a microscopical quantity of earth containing embryos of the parasite in its rhabdite form. Unwashed vegetables fouled by human ordure, and especially unwashed hands coming straight from tilling contaminated soil, are probably responsible for much of the infection. A still more direct factor is the curious custom of eating earth by the fellaheen of Egypt, and by the anæmic negroes of the West Indies and Guiana.

Treatment.—The remedy for expulsion of the parasite is thymol, which should be given in a dose of 30 grains at 8 A.M., and again in a dose of 30 grains at 10 A.M. Each dose should be administered in a tablespoonful of brandy, and should be followed in two hours after the second dose by sulphate of magnesium or castor oil. Although most of the parasites are thus expelled it is advisable to give the thymol again after an interval of a week. The treatment of the anæmia requires good food, and 8 grains of sulphate of iron, thrice daily in water.

DISEASES OF THE LIVER AND GALL-BLADDER

The liver, the largest gland in the body (weighing about 50 ounces), is situated mainly in the right hypochondrium, but its left lobe extends into the epigastric region. Its convex upper surface is applied to the corresponding concavity formed by the diaphragm. Its concave and irregular under surface is in contact at different points with the hepatic flexure of the colon, the right kidney, the duodenum, and the pyloric end of the stomach. The liver is almost completely invested by the peritoneum, but a small part of the posterior surface of the right lobe is destitute of peritoneal covering owing to the separation of the layers of the coronary ligament at that part. On the right side its upper border corresponds to a level of about 1½ inches below the nipple; on the left of the middle line it is somewhat lower. Its lower margin on the right side in front corresponds pretty much to the margin of the ribs, and this margin extends across the epigastric region at a level of about 2 inches below the xiphoid cartilage. In the axillary line its lower margin corresponds to the tenth intercostal space as a rule. Behind, its lower margin corresponds to about the eleventh rib. (Average extent of hepatic dulness to superficial percussion: middle line in front = $2\frac{1}{2}$ inches, nipple line = $3\frac{1}{2}$ to 4 inches, axillary line = nearly 5 inches). Quantity of bile secreted daily by a healthy adult is calculated at about $3\frac{1}{2}$ lbs.

FUNCTIONAL DERANGEMENTS OF THE LIVER

HYPERÆMIA OF THE LIVER (*Synonym*, Congestion of the Liver).—The phrase "congestion of the liver" is often used vaguely, and applied to cases of indigestion when there is probably little amiss with the organ. Yet we must recognise two forms of hyperæmia of the liver—active and mechanical. The former will now be considered. It depends on errors of diet in people who lead a sedentary life and at the same time eat too much or too frequently, or drink too heavily. It may also arise from contusion, or severe concussion of the organ; from infectious disease; from suppression of the menses or bleeding piles; from malarious or other poisons.

Symptoms.—The liver does not extend much, if at all, below its usual limit. There is tenderness on pressure, and the patient speaks of a sense of oppression and fulness over the hepatic region, and of an uneasy feeling rather than actual pain, which radiates from the organ to the right shoulder. This feeling is sometimes increased to actual pain after meals, or when he lies in bed on his right side. Disorder of digestion is manifested by a furred tongue, loss of appetite, nausea, or vomiting, and at times griping pain is experienced in the abdomen, when loose bilious motions are passed. Headache, lassitude, and depression of spirits are complained of, and though jaundice is rare, the countenance becomes sallow. The urine is high-coloured and loaded with lithates.

When hyperæmia occurs in this country the prognosis is favourable, but when the affection attacks a European living in India it may, according to Dr. MacLean, be the forerunner of acute inflammation of the liver.

Treatment.—Hot fomentations and an active purgative, as calomel and jalap (F. 23), do good service. The rational treatment afterwards consists in giving (1) an alkali, as bicarbonate of potassium, until the lithates disappear; (2) dilute nitro-muriatic acid, 10 to 20 minims thrice daily, with taraxacum or gentian. This acid promotes the biliary secretion and improves digestion.

Dietetic and Climatic Treatment.—The diet should be as simple as possible: stimulants and animal food forbidden. The springs of Harrogate, Kissingen, Marienbad, or Carlsbad are useful.

LITHÆMIA—HEPATIC DYSPEPSIA.—The derangements of the metabolic function of the liver are constantly made evident, and can be recognised by changes in the composition of the urine. These changes, therefore, should be looked for, and the urine of patients examined in almost every case. If the liver be functionally inactive, one of the immediate results of such faulty function, connected with albuminous disintegration, is the non-conversion of nitrogenous matters into urea, and the production of lithates and lithic acid, inducing a condition of blood to which the late Dr. Murchison applied the term "Lithæmia." This lithæmia may be relieved for a time by elimination by the kidneys, showing itself in deposits in the urine, on cooling, of lithic acid, lithates, and pigmentary matter. These deposits are often seen in persons of good health, after any excess or error in diet, or exposure to cold; and they are more or less constant in subjects of gouty habit of body, and in those who lead sedentary lives and indulge in heavy meals with the free use of alcoholic liquors. But gout, gravel, urinary or biliary calculi, and some skin affection, may be the results of frequent repetition of the conditions which cause lithæmia.

Symptoms.—The more prominent symptoms are epigastric tenderness, heartburn, flatulent distension of stomach and bowels, a tendency to sleep after meals, furred tongue, unpleasant taste in the mouth, especially in the morning. Palpitation, frontal headache, restlessness at night, irritability of temper, are other symptoms which are more or less constantly present.

Treatment.—Quinine, antipyrin, and other remedies of this class are here valueless, and even injurious, while 4 grains of euonymin, or 4 grains of blue pill and a grain of the compound extract of colocynth at night, followed by a black draught in the morning, give unquestionable relief. It is advisable also to take for some time in the early morning, an hour before breakfast, those mineral waters which contain the sulphate of sodium, as Püllna, Friedrichshall, or Carlsbad. The dose of these waters depends on circumstances, as some require a large, others a small quantity, but the object aimed at is simply to secure a free and full action of the bowels. Many with advantage stop these waters after a course of six or eight weeks, while others continue to take them regularly for four or five years, and find themselves better by doing so. In cases of this kind nitro-hydrochloric acid with taraxacum and gentian is very serviceable (F. 79*a*).

Dietetic. — Champagne, beer, and malt liquors should be interdicted, and the patient should be limited to a moderate allowance of claret or hock with his principal meal, or to a small quantity of sound whisky largely diluted with water. Riding on horseback, rowing, golfing, and dumb-bell exercise are valuable in this form of hepatic dyspepsia.

JAUNDICE.—When from certain affections of the liver, or from causes connected with other parts of the body, the secretion or the excretion of bile is interfered with, jaundice results. The term "Jaundice" is derived from the French word *jaune*, yellow. *Icterus* (the Greek word for the golden thrush), another synonym, originated in the ancient idea that the sight of this bird by a jaundiced person was death to the bird but recovery to the patient. The affection has also been termed "regius morbus," from the royal and pleasant regimen then prescribed for those who had it. We will now consider jaundice as a SYMPTOM, irrespective of its causes.

The colour of the skin is changed, and varies from a light yellow, through citron yellow, to a deep olive or bronzed tint. The conjunctivæ become yellow, and the secretions (especially the urine) acquire a saffron-yellow, greenish-brown or brownish-black tint, according to the amount of pigment present. The tests for bile in the urine are given at p. 363. The cutaneous glands also, in assisting the kidneys to eliminate the pigment, sometimes stain the linen yellow. Instances have been recorded where the secretion of the mammary glands has been found tinged with bile pigment, and still rarer cases have been noticed where the saliva and the tears have been similarly affected. On the other hand, the bile pigment is not eliminated by the mucous membranes of the respiratory passages or the digestive tube. A bitter taste is not infrequently complained of, and derangements of digestion are indicated by flatulence, constipation, and an altered condition of the fæcal evacuations. We can account for the digestive derangements by the knowledge we possess of the action of the bile. Bile is a natural aperient, and its absence causes, as a rule, constipation, and makes the motions assume a pale clay colour; but it is to be noted that in cases of jaundice, where there is no obstruction of the common bile-duct, the motions may be but little altered. The function of digestion is normal, except in regard to fatty matters, and when substances containing fat are taken the fat is mainly found unaltered in the fæces. There is generally a sleepy, drowsy sensation. The pulse is often very slow. Cerebral symptoms, such as convulsions, coma, and delirium, occasionally supervene (if the jaundice continues long), and are probably due to waste products which have accumulated in the blood. Itchiness of the skin without any eruption may be experienced; at times urticaria, lichen, boils, or carbuncles are observed.

Pathology of Jaundice.—The pathology of jaundice involves problems of considerable intricacy, some of which are as yet undecided. The view has usually been entertained that jaundice was of two forms, an obstructive and a non-obstructive. The mode of production of the former kind was easy of comprehension, being due to an obstruction of any kind situated in the larger or middle-sized bile-ducts, thus preventing the natural outflow of the bile. Such obstructions are most commonly met with in the form of impacted gallstones; catarrhal swelling of the mucous membrane of the ducts; tumours involving some part of the ducts, as cancer, either of the liver itself or of the head of the pancreas; abdominal aneurysm; foreign bodies; accumulation of fæces, or the gravid uterus. In the other class of cases the jaundice was at one time supposed to arise from "suppression of secretion," the liver being supposed to secrete bile from the blood; this view has long since been abandoned. We refer now to cases in which, without any apparent obstruction, jaundice occurs, as for instance in certain fevers, pneumonia (occasionally), pyæmia, acute yellow atrophy, and poisoning by phosphorus. Other views were then advanced to explain the jaundice. One which gained considerable favour was that of a "hæmatogenous" jaundice, as distinguished from a hepatogenous. It was supposed that the jaundice arose, not from the passage of bile into the blood, but from a decomposition of the red corpuscles within the blood itself; the hæmoglobin becoming converted into hæmatoidin, which, as Virchow showed, is identical or almost so with bilirubin. Another theory was advanced by Frerichs to the effect that in health a large proportion of the normally secreted bile is reabsorbed from the intestine into the system and is decomposed; jaundice would on this view be accounted for by failure of the normal metabolism. A limited proportion of cases was also explained on the occurrence of a difference in the normal relations of the blood-pressure in the portal and hepatic veins. When the former is from any cause markedly and also suddenly lowered, a backward flow of bile occurs into the lymphatics of the liver. Icterus neonatorum and the jaundice resulting from mental emotion are usually explained on this hypothesis.

The view of Frerichs is quite a possible one, and has not been disproved, but more recent investigations have cast grave doubts on the existence of a hæmatogenous jaundice. The most recent experiments go to show that the liver is always the seat of the disorder, the jaundice being in point of fact due to a tenacious or inspissated bile secreted in such cases, which is unable to flow down the ducts. Hence it is highly probable that all forms of jaundice are in reality obstructive, and in the cases of supposed non-obstructive jaundice, the obstruction exists high up in the fine bile-ducts.

Experiments have also shown that the bile never passes directly into the blood in the liver; it always passes into the lymphatics and is carried by them into the thoracic duct, and so into the general circulation.

ORGANIC AFFECTIONS OF THE LIVER

Mechanical Hyperæmia or Nutmeg Liver.—This condition may supervene on a variety of serious affections of the heart and respiratory organs. Incompetence of the tricuspid or stenosis of the mitral valve is the most frequent cause, for pressure in the inferior vena cava then increases and is followed by an impeded circulation in the hepatic veins. In these circumstances the hepatic veins become permanently distended and cause atrophy of the hepatic cells in the centre of the lobules. This condition is commonly termed "Nutmeg Liver." A slighter variety may also be induced by emphysema, chronic bronchitis, and any other cause which impedes circulation through the vena cava inferior, as tumours.

Symptoms.—In the early stage the liver may become much enlarged, while in the later stage its normal size is diminished. The obstruction from the hepatic veins to the portal vein occasions hyperæmia of the walls of the digestive tract, and gastric symptoms arise, viz. slow digestion and retarded peristaltic action. Jaundice to a greater or less extent appears on the body, and the face has a slightly livid hue. The prognosis will be influenced by the nature and stage of the chest disease, or from other causes.

Treatment.—So far as possible we must endeavour to remove the cause. The hyperæmia may be relieved by saline purgatives or calomel.

DISEASES OF THE BILE PASSAGES

CATARRHAL JAUNDICE.—This is the most common form of jaundice, and is believed to be due to catarrhal inflammation which has spread up from the duodenum to the common bile-duct, causing swelling of its mucous membrane. This condition is propagated more or less along the larger and medium-sized ducts to the gall-bladder.

Etiology.—It attacks both sexes equally, and is more frequent in youth than old age. It can be readily understood how indigestion, as from a "spoiled stomach," should cause gastro-duodenal catarrh and catarrh of the bile-ducts, or how exposure to cold, notably in the spring and autumn months, when there are sudden and frequent variations of the temperature, may affect the membranes mentioned, like other mucous membranes, in a sporadic or even epidemic form.

Symptoms.—There are at first dyspeptic symptoms and uneasy sensations in the hepatic region, or pains in the back or limbs. Jaundice sets in after the lapse of three or four days, the stools become clay-coloured, the urine contains bile pigment, the face has a bright yellow tint, the pulse may be normal, or occasionally very slow. The liver is usually slightly enlarged and its edge can be felt below the costal margin. Constipation exists as a rule, but sometimes there is diarrhœa. In the epidemic form the onset may be more severe, with chill, headache, and vomiting. The duration of the disease is from four to eight weeks, but in some cases it persists for three months or more. There is another form of jaundice, usually grouped with catarrhal jaundice, in which the symptoms are different. This is termed "Simple Jaundice." In this form we can hardly ascertain anything, whether by questioning the patient, or by physical examination, beyond the facts that the skin and conjunctivæ are yellow, that the urine contains much bile pigment, and that the motions are clay-coloured. There is neither pain nor distress, and the patient's friends may first observe the yellow tint, or the patient himself may observe it in the looking-glass. One symptom, however, is noteworthy, viz. *retardation of the action of the heart*, as evidenced by a slow pulse, which may fall to 50, 40, or even 20 beats in the minute. This should not modify a *favourable prognosis* by the dread of the supervention of cerebral symptoms, as such rarely occur; and after a variable period the jaundice passes away.

Differential Diagnosis in Jaundice from Catarrh of the Bile-ducts.—(1) Clay colour of the stools, or a tumour corresponding to the region of the gall-bladder, favours the idea of obstruction, and this view is rendered more probable if the jaundice is not slight but intense.

(2) The mode of commencement of jaundice gives an important clue, for if it begins suddenly in a person whose previous health has been good, and if it be attended by colic, vomiting, and clay-coloured stools, then it is most probably due to obstruction of the duct by a foreign body. And this view is strengthened if there be a history of previous attacks of jaundice of a similar character.

(3) Pain, severe and paroxysmal, points to gallstones or cancer. The cancerous cachexia, the age, the history of failing health and emaciation before the pain sets in, indicate cancer.

(4) Jaundice occurring with enlargement of the liver is most probably due to cancer or cirrhosis, and this supposition is confirmed if there be ascites. The diagnosis of the latter is assisted by a history of alcoholic dyspepsia and the previous habits of the patient. Then it will depend on cirrhosis. If there be no evidence of over-indulgence in stimulants, and if there be darting pain, it will probably depend on cancer.

(5) Jaundice accompanied by fever is either secondary to some acute febrile disease or is due to an abscess of the liver dependent upon *pylephlebitis*, or to a suppurating hydatid tumour opening into a bile-duct, or to inflammation of the bile-ducts. The fever in these cases is persistent, while in that which occurs from gallstones it is temporary.

(6) Jaundice with cerebral symptoms is due to acute atrophy of the liver, poisoning by phosphorus, some specific fever, lobular pneumonia, or nervous shock.

(7) Jaundice in a young person, if it be preceded by symptoms of gastric catarrh, is generally catarrhal.

Prognosis.—This is favourable.

Treatment.—The obstruction in catarrhal jaundice may be temporarily overcome by an emetic, but it will not be permanently removed, and in the majority of cases the *treatment* must be symptomatic. Constipation at the commencement of an attack may be treated by calomel or pil. hydrarg. (gr. 2) in combination with colocynth or rhubarb pill, followed by a saline aperient draught in the morning. Afterwards constipation should be met by a drachm of Carlsbad salts in a tumblerful of warm water, sipped before breakfast, instead of being taken as a draught. When diarrhœa is present, salicylate of bismuth (gr. 10) is a good remedy. When gastro-duodenal catarrh is the most prominent symptom, hepatic stimulants, as euonymin, iridin, and ipecacuanha, are useful (F. 25*a*); when flatulence is troublesome, carminatives or pil. acid. carbolic may be given. If no fever exists, exercise in the open air is preferable to remaining indoors, and warm poultices at night over the liver are serviceable if pain be present. When the flow of bile is re-established, warm baths should be taken to remove the yellow condition of the skin. To relieve itching, which often is a distressing symptom, a Turkish bath is of service. If the disease lingers long the waters of Carlsbad, Marienbad, or Homburg are indicated. In *Simple Jaundice* the same line of treatment should be adopted.

Diet.—The diet should be spare, and consist of soups and light puddings, with natural alkaline waters as Vichy. Pastry, fatty and saccharine substances, and alcoholic beverages, especially fermented liquors, should not be taken.

GALLSTONES.—Gallstones result from the precipitation of certain substances held in solution in the bile—the precipitate, whether amorphous or crystalline, uniting to form larger or smaller concretions. They are formed chiefly in the gall-bladder, and their number is variable, usually from five to ten. Sometimes the number given is greatly exceeded, reaching to a hundred or several hundreds, of the size of a pea. Practically, biliary calculi may be divided into "small stones," from the size of a pea to a grain of sand; "medium-sized," from the size of a pea to a hazel-nut; "large stones," usually single, from the size of a walnut and even up to the dimensions of a moderately filled gall-bladder. Their shape is variable, but in general they are round or egg-shaped, and if they are multiple, facets are observed on them, whilst their corners are rounded off. Their flat surfaces appear ground, and are either plane or slightly concave or convex. They are in colour usually brown, greenish, or yellowish-brown. They are somewhat greasy to the touch, and soft in consistence, so that they can easily be nicked with the finger-nail. As their specific gravity is usually 1027 they cannot float in the bile, the specific gravity of which is from 1020 to 1026.

Structure and Composition.—In structure they are occasionally simple, consisting of pure crystallised cholesterine, bile resin, or cholesterine and soap; or they may be compound and nucleated, with a shell surrounding this nucleus, and a crust or rind.

The chemical composition of compound biliary gallstones consists of substances found in the bile, or derived from the decomposition of substances found there, viz. cholesterine from 70 to 80 per cent, biliary colouring matter, biliary acids and their salts, fatty acids, and lime, especially in the form of the carbonate.

How do they originate? Naunyn has shown that the mucous membrane of the biliary passages forms the cholesterine and lime salts of the bile, and that catarrh increases the amount of these substances. As micro-organisms are very frequently associated with gallstones it seems "that a lithogenic catarrh induced by micro-organisms is the most important single factor" in causing gallstones. Numerous conditions favour their formation. They are rare below the age of twenty-five, tolerably frequent after forty, and relatively to these ages most numerous in old age; and with regard to the sexes, they are seen in females more frequently than in males, the proportion being 3 : 2. Sedentary habits predispose to them, and it is asserted their occurrence is sometimes hereditary; a faulty, luxurious diet begetting corpulency, and an extreme interval between meals allowing the bile to be retained too long in the gall-bladder, undoubtedly act as conducers to their formation. And to these must be added tumours pressing on the biliary passages, inflammation or degeneration of the gall-bladder, catarrh of the ducts, or any circumstance which tends to block up their channels and retard the flow of bile.

How are they evacuated? Naturally through the excretory duct of the liver or gall-bladder into the ductus communis choledochus, and thence into the intestinal canal, whence they usually escape per anum; occasionally they leave this natural path, and by ulceration and perforation reach various and often far-distant parts of the body. Thus they may be found in the liver itself or hepatic duct; they may pass from the gall-bladder into the stomach or colon, or from the biliary passages into the duodenum. They may wander into the urinary passages, the interior of the portal vein, or the cavity of the abdomen. When they have reached the intestine they may become impacted, and give rise to intestinal obstruction, or may cause perforation of the intestines.

So long as gallstones lie quietly in the gall-bladder they may give rise to no prominent symptoms, but the situation is altered when they are set in motion and advance through the excretory duct towards the intestine. Then their passage may give rise to what is termed "biliary" or "hepatic colic." With this colic there is pain setting in sharply and suddenly, beginning at the epigastrium and radiating upwards towards the right shoulder-blade. The pain occurs in paroxysms, and is described as being boring, burning, or tearing, and women say that it is greater even than labour pangs. There is also vomiting, at first of the food in the stomach, and, if there is complete obstruction of the duct, of colourless acid fluid, or of bilious matter if the obstruction is removed. After from twelve to twenty-four hours of pain and vomiting, if the obstruction remains, jaundice more or less pronounced results. The urine becomes of a dark brown, mahogany colour, and the fæces are pale. Permanent closure of the duct is rare, and the jaundice does not last long,—a couple of days, or at most a couple of weeks. Severe attacks have been known to terminate in collapse and death, but this is rare, and the recurrence of the colic seems to depend on varying causes, and to follow at no well-assured intervals.

Treatment.—The object of the treatment is obviously to moderate the pain and to facilitate the passage of the stone by increase of the biliary secretion. Morphine injected hypodermically certainly lessens the pain, but it has the disadvantage when used of diminishing the biliary secretion, and, in some instances, of exciting vomiting, which is followed by alarming collapse. Antipyrin renders only mediocre service, and time should not be lost by prescribing it. The inhalation of chloroform eases the pain, and possesses the advantage of not hindering the secretion of bile; it also relaxes the muscular fibres of the bile-duct. Chloral has an equally good action, but it should be administered as an enema, since in this painful affection it is not well to trust to its slow action when given by the stomach. To increase the biliary secretion salicylate of sodium should be given with large quantities of fluid, as the latter seems to increase the action of the sodium salt. Large doses of olive oil are said to have a cholagogue action, but this is probably a mistake.

Whatever medicinal remedies may be selected, it is, from all experience, evident that copious draughts of warm water to which a little bicarbonate of sodium has been added, are invariably advantageous. So also hot poultices or fomentations applied to the hepatic region do good. When these are not well borne, ice finely chopped and placed in a bladder may be tried. If there be vomiting, ice may be sucked or iced champagne given in small quantities at a time. After the crisis is over, but not till then, a saline aperient should be ordered to clear away the bile that has found its way into the intestine. Tincture of podophyllum given occasionally appears to hinder the re-formation of gallstones. To dissolve gallstones already formed, spirit of ether 30 to 60 m., or 5 or 6 m. of oil of turpentine mixed with the yolk of an egg, have long had a deserved reputation. This mixture should be continued until there is no yellowness of the eyes, and no pain felt in the hepatic region after taking food or exercise. If a gallstone become impacted in the common duct, and the measures mentioned fail, it may be necessary to perform the operation of *cholecystotomy* or opening the gall-bladder for the removal of calculi. It may be recommended when the gall-bladder can be felt below the costal margin, and when there are urgent symptoms pointing to the presence of a calculus. "If there be jaundice the indications for the operation are not so clear, as the calculus has certainly passed beyond the cystic duct. Yet in some cases it has been found possible to press it back again into the gall-bladder, or to crush it *in situ* and remove the fragments through the opening of the gall-bladder."

Dietetics.—As acidity with indigestion and superabundance of bile are probable causes of the re-formation of concretions, it is necessary to enjoin abstinence from substances which contribute to make the urine yellow and notably acid, *e.g.* salads, highly-spiced food, asparagus, and excess of animal food. A moderate use of fruits is recommended. If circumstances permit, the patient will obtain marked benefit by going at the proper season to take at their sources the waters of Carlsbad, Kissingen, Homburg, or Vichy.

HYPERTROPHY OF THE LIVER.—Before discussing what is known as "Cirrhosis," we think it well to mention a hypertrophied condition of the liver, which is due *simply* to enlargement and multiplication of the secreting cells of the liver. The hypertrophy may be *partial* or *general.* The former may occur from tight-lacing, or it may be compensatory to some other portion of the liver reduced or entirely destroyed by disease. The latter has been found in some cases of diabetes mellitus and in leukæmia. Hypertrophy is also observed in Europeans who have for some time resided in hot climates, and it may occasionally be met with in the drinkers and free livers of any country.

CIRRHOSIS,

the so-called gin-drinker's or hobnailed liver, derives its name from κιρρός, yellow, the colour being due to the large amount of yellow pigment found in the secreting cells.

Morbid Anatomy.—The liver is reduced in size, and while there is a general reduction in every diameter, it especially affects the right lobe. The colour of the organ is a pale olive brown, the surface is extremely granular, and the capsule is nodulated and opaque. On section it is found that the Capsule of Glisson has become greatly thickened, from new formation of connective tissue. As a consequence of this the lobules are separated, compressed and atrophied, and in some cases the new tissue insinuates itself between the rows of hepatic cells. The bile-ducts are, however, seemingly even more abundant than normal in the thickened portal canals, and are supposed by some to be new-formed, but they are most likely derived from pre-existing hepatic cells. From obstruction to the circulation the spleen is generally much swollen, and the kidneys may present evidence of chronic inflammatory lesions. The mucous membrane of the stomach exhibits a state of chronic catarrh.

It is chiefly met with in adults between 35 and 60, in males more than in females, and is almost invariably connected with a previous history of excessive alcoholic indulgence.

Course and Symptoms.—The disease is chronic, usually extending over several years, and its beginning is insidious; at first there is probably an increase in size of the liver, but latterly there is a decided diminution in its bulk. In its early stages it is attended with what may be termed *Alcoholic Dyspepsia*, sickness and retching in the morning, loathing for solid food, and a strong desire for stimulants, with some slight pain or tenderness over the hepatic region. The next symptom is not infrequently *hæmatemesis* or vomiting of blood. This is due to the commencing obstruction in the portal circulation, which leads to congestion of the mesenteric, gastric, and splenic veins, and a tendency to hæmorrhages from the mucous surface of the stomach and intestine. The quantity thrown up is often as much as one or two pints, and the vomiting may be accompanied or followed by the passage of blood per rectum. Hæmorrhoids at the same time are not infrequently present. The next result of the obstruction is *ascites*, enlargement of the spleen, and the surface of the abdomen is covered by large veins, running between the iliac and thoracic trunks. The disease is now marked by progressive emaciation and debility, by a persistent sallow complexion, (though actual jaundice is rare), by increasing dyspeptic derangements, and it results fatally, sometimes by exhaustion attended with coma or œdema and inflammation of the lungs.

Treatment.—In the *early* stages the essential thing is to stop drinking habits. Spirits should be forbidden, although a little claret or hock may be allowed. The diet should consist of milk, eggs, plainly-cooked white fish, game, and meat, while all hot spiced or greasy food must be avoided. Regular exercise should be enjoined, and the action of the bowels facilitated by occasional saline or mineral water aperients, and the use of nitro-muriatic acid. In the *second* stage, though curative treatment is impossible, yet the same dietary must be enjoined. Purgatives and diuretics should be given for the ascites (F. 27, 35); and, these failing, recourse must be had to tapping.

Although the hobnailed or gin-drinker's liver is by far the most common form of cirrhosis, yet pathological research has shown the existence of other varieties, as—I. Cardiac or cyanotic cirrhosis in consequence of prolonged venous hyperæmia, depending upon cardiac or pulmonary disease; II. Biliary cirrhosis, when there is some permanent or protracted occlusion of the common duct, as by a calculus; III. Malarial cirrhosis: the indurated and pigmented liver met with in those who have been the subjects of chronic malarial poison; IV. Rachitic, probably a form of congenital syphilis; V. Scarlatinal, as interstitial hepatitis, sometimes observed in the bodies of those who have died from scarlet fever.

Fatty Disease of Liver.—The increase of the liver here is due to the accumulation of fat in the organ. Two opposite conditions may give rise to this. These are—1*st*, When the nutrition of the system is too great, as in obesity, and when, with little exercise, excess of alcoholic stimulants is taken; 2*nd*, when the nutrition of the system is too little, as when wasting disease exists, as in phthisis, cancer, ulcer of the stomach, and chronic dysentery. Its production in the first condition is easily understood from the general plethora which exists; in the second, the system feeds on its own resources, the blood becomes loaded with fatty matters derived from the patient's tissues, and this fatty matter is separated in the passage of the blood through the liver. The enlargement here is tolerably uniform in all directions, so that the natural form of the organ is little altered. The outer surface is smooth and the lower margin rounded. It is flabby to the touch, and when the abdominal parietes are thin, its soft doughy consistence can be readily appreciated. There is no ascites and no jaundice, and from first to last the enlargement is unattended with pain. The skin is almost semi-transparent and waxy in appearance, and becomes, according to Dr. Addison, especially in females, "so exquisitely smooth and soft as to convey a sensation resembling that experienced on handling a piece of soft satin."

If the disease be of plethoric type, and if it be associated with fatty degeneration of the heart, then the cardiac impulse is feeble, the sounds faint, the pulse slow or quick, feeble and irregular. If it be associated with fatty degeneration of the kidney, then the urine will be scanty, containing much albumen and tube-casts, with a tendency to general anasarca and extreme pallor of the countenance.

Treatment.—If dependent on indolent habits, an anti-saccharine or a Banting dietary with exercise must be enforced; and if due to alcohol, withdrawal of stimulants. In both cases alkalies with taraxacum or with chiretta (F. 10) are useful, and if circumstances permit, Marienbad can be strongly recommended.

Albuminoid Disease of the Liver (Waxy Liver).—The liver here undergoes greater enlargement than from any other disease, excepting perhaps cancer, so that instead of 50 ounces it weighs from 150 to 160 ounces. The disease is recognised by the following characters:—(1) By the great enlargement. (2) By the growth being uniform in every direction, and by the dense, firm, and resistant feel to palpation of the portion of the organ which extends below the margin of the ribs. (3) By the absence of pain or tenderness and the presence only of weight or tightness in the right hypochondrium. (4) By its slow and gradual growth, and by the spleen being as a rule also enlarged.

The general symptoms are those of anæmia and debility. The quantity of the urine is increased, it has a low sp. gr. and contains a large quantity of albumen; under the microscope, hyaline casts are observed. The conditions which favour its occurrence are long-standing purulent discharges from diseased bones or joints, constitutional syphilis, tubercle of the lungs or intestines, chronic constitutional diseases of long-standing which seriously impair the general nutrition, as protracted ague or dysentery.

Treatment.—It is essential to prevent its occurrence by removing the causes which favour its appearance. Thus in protracted suppuration remove diseased bone, in constitutional syphilis and dysentery prescribe the appropriate remedies. When the disease is established, the diet should be nutritious, an allowance of alcoholic stimulants is useful, and when the condition is not too far advanced, the patient should be advised to go to a mild or equable climate. Of medicinal agents, iron, nitro-muriatic acid, tincture of iodine, and cod-liver oil are most favoured. If dropsy has set in, diuretics should be given, as acetate of potassium and digitalis (F. 37).

HYDATID DISEASE OF LIVER.—Hydatid tumours in man are developed from the eggs of a tapeworm which enter the body from without. This tapeworm—the *Tænia echinococcus*, the length of which does not exceed a quarter of an inch—has only four segments, the ova being contained in the last. It inhabits the intestines of the dog, in the fæces of which the ova are voided, subsequently finding their way into the human body in drinking-water or upon the leaves and stems of young vegetables. Arrived in the intestines, they are developed into embryos which penetrate into the liver and other parts, and proceed to form hydatid cysts.

The ova of *Tænia echinococcus*, however, develop in other animals than man, and especially in sheep. The echinococci of sheep are set free in the process of slaughtering, and are devoured in the offal by dogs, to be again developed into tapeworms. The disease in man is kept up by the cycle of infection between dogs and sheep.

As a prophylactic measure dogs should be excluded from slaughter-houses, and not fed on offal of sheep. Hydatids are most common in Iceland, probably due to the dogs being closely huddled together in crowded dwellings with human beings during the winter months.

In hydatid tumours of the liver the organ is not increased in every direction. The increase usually follows one particular direction—upwards, downwards, or laterally, and the cyst may burst into the peritoneum, stomach, intestine, or lung. Sometimes it may suppurate, or it may dry up. The commencement is usually insidious, and the tumour, smooth and elastic, may attain a great size without the patient being aware of its existence, as the general health may be unaffected, there being neither dropsy nor jaundice.

Diagnosis.—When detected, the painlessness and the absence of the peculiar cachexia distinguish it from cancer; the history and the absence of constitutional symptoms from abscess; the position and non-jaundiced appearance of the patient from enlarged gall-bladder. Occasionally, if near to the surface, there is a sign elicited by percussion, known as "hydatid vibration," characterised by a peculiar trembling sensation being imparted to the three fingers of the left hand when they are laid flat on the tumour, and the back of the left middle finger is struck abruptly with the point of the middle finger of the right hand.

Treatment.—The treatment is chiefly surgical. If the cyst is increasing, simple puncture with a trocar and removal of the fluid contents in many cases effects a cure. If this fails, incision and evacuation of the contents is necessary.

ABSCESS OF THE LIVER.—Abscesses of the liver may be divided into two classes: (1) Tropical abscess; (2) other forms of abscesses resulting from certain morbid states, as pyæmia, suppurating hydatid cysts, and other parasites, lobular hepatitis, blows on the liver, gallstones. Although their etiology and pathology are widely different from those of tropical abscess, yet their diagnosis remains the same.

Tropical Abscess of the Liver is not uncommon in the East, and occasionally occurs in those who have come home after a residence there. The connection between abscess of the liver and dysentery has long been recognised, and it may safely be asserted that in 75 per cent of cases a history of some degree of dysentery can be elicited. The discovery of the *amœba coli* in connection with dysenteric and hepatic discharges goes far to prove the contention that an abscess of the liver is connected with dysenteric inflammation, and that this micro-organism is the real cause of both diseases.

Symptoms.—The local symptoms in pyæmic abscess are often masked by grave constitutional symptoms which pyæmia engenders, and the implication of the liver may only be revealed at a post-mortem examination.

In some cases of Tropical abscess the local symptoms are not much manifested, but in the majority of cases there is local pain, a sense of fulness and weight, irregular fever, shivering and sweating, enlargement and tenderness of the liver, sometimes with jaundice, and afterwards a fluctuating tumour is detected in the organ. The pain is variable in degree, and is sometimes only present in the shoulder. Reflected irritation also occasions a short and dry cough. The abscess may burst into the peritoneal cavity, giving rise to fatal peritonitis, or it may open into the biliary ducts and be discharged by the duodenum. Much more frequently the termination of the abscess is by pointing and opening externally, or by opening into the colon. If it opens into the pleura or pericardium a fatal result will ensue, but if it be into the lung, the issue is more hopeful.

Treatment.—If due to acute hepatitis, without suppuration being evident, Indian authorities agree in recommending ipecacuanha in doses from 15 to 20 grains at intervals of five, six, or eight hours, with hypodermic injections of morphine and the application of poultices to relieve the pain. In doubtful cases an exploratory canula should be inserted, and if pus be found the abscess cavity should be freely laid open. Even if the trocar does not show any pus, marked relief may be afforded by its introduction into an inflamed liver.

Acute Yellow Atrophy.—In this fortunately rare disease the liver undergoes a rapid degeneration of its tissue, and diminution of its size to two-thirds or one-half its normal bulk. The essential change is a granular and fatty degeneration, and consequent destruction to a greater or less extent of the hepatic cells. On section, the liver is of a yellow colour, with patches of bright red. In the yellow parts the destruction is less pronounced than in the red parts, where the degeneration of the tissue is complete, and the vessels are alone left to represent the substance of the liver. Under the microscope nothing may be seen but granules of albuminous matter, fat, and pigment, and larger globules of fat.

Causes and Symptoms.—It is often preceded by great mental emotion, and, as a rule, occurs only in women who are pregnant, or in females who have led a dissipated life, or who have had constitutional syphilis. Gastric catarrh and bilious vomiting are followed closely by jaundice and pain in the hepatic region and diminished hepatic dulness. After two or three weeks, cerebral symptoms supervene, as headache, delirium, and gradually-developing coma with convulsive twitchings. The urine, which is generally albuminous, exhibits a remarkable decrease in the amount of urea, uric acid, and salts, but contains two new compounds—leucin and tyrosin. Pregnant women as a rule abort. After the severe symptoms set in, death occurs in from two to four days.

Diagnosis.—This is difficult until the cerebral symptoms commence, when it is generally easy. Poisoning by phosphorus leads to the same degeneration of the liver, and is attended with similar symptoms. The history of the case, and the detection or non-detection of leucin and tyrosin in the urine, form important clues to diagnosis.

Treatment.—This is unsatisfactory, and in the main palliative. The disease is always fatal.

There are other conditions of the liver besides cirrhosis and acute atrophy of the liver in which the liver becomes much smaller than in health.

1. SIMPLE ATROPHY.—This occurs chiefly as the result of old age and inanition. The organ may be reduced to half its size, but there is no alteration in its structure, and no induration. It produces no symptoms. Partial atrophy may occur from tight-lacing, or from the external pressure of organs in the neighbourhood. Dr. Murchison has described a form of atrophy with nodulated surface, but without any cirrhosis. This atrophy may cause ascites and may not during life be distinguished from cirrhosis. 2. CHRONIC ATROPHY OF FRERICHS OR RED ATROPHY OF ROKITANSKY.—This form is seen in many wasting diseases. It may also follow malarious fevers or dysentery. The cut surface is dark red or pale brown; the acini are either invisible or else smaller than natural. It may produce ascites but rarely jaundice. 3. ATROPHY FROM PERIHEPATITIS.—Inflammation of the capsule of the liver here compresses the liver, obstructs the portal circulation, and atrophy with ascites results.

CANCER OF THE LIVER.—The enlargement is great and progressive, and nodular excrescences, irregular, hard, and resistant, can often be detected on palpation. Pain is often a prominent symptom. In almost all cases jaundice results from compression of the bile-duct by cancerous nodules in the liver, or by enlarged glands in the portal fissure, and when jaundice does appear it is persistent. Cachexia is marked. In about one-half of the cases fluid is observed in the peritoneum at a late stage of the disease. In fully three-fourths of the cases the cancer is not *primary* but *secondary* to the same disease in some other organ, as the stomach, uterus, rectum, or female breast. The course of the disease is rapid. If medullary it is fatal within a few weeks or months, and if it be hard, it is rarely prolonged beyond twelve months. It is uncommon before the thirty-third or fortieth year.

The *Treatment* is entirely palliative, and consists in allaying pain, and in relieving the gastric disturbance and constipation. The *diet* should be light but nutritious.

Syphilitic Disease of the Liver.—This may be *congenital* or *acquired.*

Congenital Syphilis produces diffuse hepatitis and gummata, the latter being less common.

Acquired Syphilis.—The liver occasionally becomes diseased during the tertiary stage of syphilis, and produces, as in the congenital form, diffuse hepatitis and gummata, but the latter are much more frequent. The gummy tumours—"the encysted knotty tumours" of Dr. Budd—are seen on section of the liver, in its deeper parts, as a number of globular growths, more or less firm in consistence, of a yellowish-white colour, and varying in size from a pin's head to a walnut. Deeply indented cicatrices leading to caseous masses are usually visible on the surface of the organ.

Symptoms.—The size of the liver is enlarged in some cases, contracted in others, and occasionally firm globular elevations can be felt on its surface. Neither ascites nor jaundice is necessarily present, but in particular cases they may occur from the pressure of a gumma upon the portal vein or the bile-duct. Albuminuria, from coexisting lardaceous disease, is often associated with it, and in advanced cases, profuse and obstinate diarrhœa.

Treatment.—In early cases iodide of potassium does good, but if accompanied by lardaceous disease little benefit can be expected from any form of treatment.

DISEASES OF THE PANCREAS

The functions of the pancreas have lately attracted much attention. In diabetes of a grave form we now know that it is atrophied, and hence the term "pancreatic diabetes" has come into use. The pancreatic secretion is now regarded as of most importance in "duodenal digestion," acting as it does upon proteid elements and albumoses as well as upon starches and fats. A deficiency or absence of pancreatic secretion originates symptoms indicating deranged intestinal digestion, especially flatulence, and also diarrhœa or constipation, with the presence in the stools of free fat or oily matter, or of certain fatty compounds.

The organ may be attacked by acute inflammation, or by chronic diseases, as cirrhosis, fatty hypertrophy, amyloid disease, cancer, or by obstruction and dilatation of the duct (pancreatic cysts).

The *diagnosis* of these affections is very difficult, almost impossible. It may be stated as a general rule that serious disease of the liver or stomach will probably reveal itself by obvious signs, and if this can be excluded in certain cases, the diagnosis of pancreatic disease will be appreciably aided. Thus cancer and large pancreatic cysts may be recognised, and some of the other affections might be suspected.

Treatment.—In the large majority of cases of pancreatic disease, the treatment can only be symptomatic, directed especially to the relief of pain, to the symptoms connected with deranged digestion, and to the state of general wasting and debility.

DISEASES OF THE DUCTLESS GLANDS

DISEASES OF THE THYROID GLAND

In connection with the Thyroid Gland we shall describe Goître, Cretinism, Myxœdema, and Exophthalmic Goître.

Goître is the most common affection of the thyroid, and consists in enlargement of its normal constituents—connective tissue, cells, vessels. Sometimes these are increased in equal, and at other times in unequal, proportions, so that the nature of the enlargement is different.

If the connective tissue alone be enlarged, the hyperplasia may occur diffusely, so that the whole gland is more or less involved, or it may occur in the form of circumscribed nodules; if the epithelial cells of the gland and alveoli be chiefly affected they are filled with colloid material, and cysts are formed; if the blood-vessels be affected they undergo marked dilatation. Very frequently all these varieties of lesions occur in the same goître. The enlargement varies usually from mere fulness to the size of a cocoa-nut, but at times it assumes such large dimensions as to form a tumour, which conceals the chest, and sometimes reaches over the greater part of the abdomen.

The enlargement of the thyroid is peculiar to certain localities, and constitutes the goître of the Swiss and the Derbyshire neck of England. It is also seen, but to a less extent, in Devonshire, and seems in all cases to be associated with a water-supply greatly impregnated with the sulphate and carbonate of lime. Some consider that the calcareous water is aided by endemic miasmatic influence, or by an actual micro-organism which is specially developed over certain rock-formations.

Symptoms.—The enlargement is characterised by no pain until it acquires a large size, or, from its development, presses upon important structures, as the large veins of the neck, or on the trunk of the sympathetic nerve, or on the pneumogastric and recurrent laryngeal, or on the brachial plexus. It may also compress the œsophagus and trachea, and give rise to a long train of evils, which accrue from obstructed respiration or impeded deglutition.

Cretinism.—Cretinism and goître are intimately connected, for there is no district in the world known "in which endemic cretinism occurs and in which goître does not likewise prevail. Again it has been noticed that when a family migrates into a place where the two diseases are met with, goître is first developed in them; and it is only in the second or third generation that cretins present themselves."

Adopting this statement as true, we may say that cretinism is observed in the valleys in Central Europe, near to large mountain chains, where there are few atmospheric changes, and where magnesium limestone is present in excess in the soil through which the water permeates. In England it has been noted in the dales of Lancashire and Yorkshire. The physique of a typical cretin is remarkable. In stature he is rarely more than 5 feet. His skin is thickened or wrinkled, yellowish tawny in colour, and looks too large for his body. The expression of the face is stupid, the lips are thick. The tongue is large and thick, and often protrudes from the mouth. There is generally also dribbling of saliva. The abdomen is, from looseness of the skin, pendulous, and the legs are short and deformed. The cranium is hydrocephalic, from the delayed ossification of the fontanelles and sutures. The intellectual faculties are imperfectly developed, and the cretin is often unable to speak, and rarely can hear. Cretins are generally impotent, and few live beyond thirty years.

In the great majority of cases of "sporadic cretinism" the THYROID GLAND IS ENTIRELY ABSENT, but in almost every other respect, as regards physique or intelligence, the two forms of cretinism are identical. A peculiar, movable, FATTY tumour in the "posterior triangle" outside the sterno-mastoid muscle has been shown to exist in sporadic cretinism.

Treatment.—Departure from the district in which the goître has been contracted is an essential part of the treatment. Different air and water supply, with food rich in iodine, eggs, milk, fresh-water plants, and fermented liquors, may be sufficient to reduce the enlargement, and the climatic and dietetic treatment is also materially assisted by the use of preparations of iodine or iodoform. Thus Duguet recommends the injection of tincture of iodine, 8 to 10 drops at a time. Kappen and Moestig use iodoform injections, and Reverdin advocates iodoform 3 grains daily, internally. Extirpation and enucleation are extensively practised, preferably the latter. In *cretinism* great improvement follows thyroid administration. There is rapid bodily growth. The mental improvement is neither so rapid nor so complete.

MYXŒDEMA (*μύξα*, mucus; *οἴδημα*, swelling)

This disease depends on loss of function of the thyroid gland.

Symptoms and Course.—Adult females are more commonly attacked than men. Those suffering from myxœdema present pathognomonic symptoms, especially on the face, which is swollen in every feature, the swelling being waxy-looking; and, as proving its non-renal origin, affecting equally dependent and non-dependent features. The swelling does *not* pit on pressure, and there is a defined scarlet flush of cheek and nose, which markedly brings out the waxy pallor round the eyes and mouth. The loose, baggy, almost translucent lids, the dry brawny cheeks, the thick blubber lips, the swollen red (spade-like) hands, the deliberate speech and volition, constitute a group of symptoms which can hardly be mistaken for any other disease.

The conditions, moreover, noticed in the face are seen, on more minute examination, to invade all parts of the body, for the skin is everywhere thickened, translucent, dry, and rough to the touch, with absence of perspiration. The general symptoms, apart from those mentioned, indicate gradual deterioration, physical and mental. The body and mind become unwieldy. The movements of the limbs are languid, the maintenance of fixed attitudes difficult, and falls are not uncommon. Thought and volition lag. Ideas come gradually and are tardily expressed, yet the language is correct. Though the handwriting is little changed, still the act is performed with hesitation and apparently by concentrated attention. Ultimately the memory fails.

The temperature is persistently subnormal, ranging between 98° and 94° F. The debility increases, but not rapidly, and the prognosis is unfavourable to recovery unless proper treatment be adopted; and death, after a course of six years or more, is ushered in either by coma or uræmia, or results from inanition.

Pathology.—Myxœdema is due to atrophy with loss of function of the thyroid gland. In health this gland secretes a colloidal fluid which is essential to the healthy metabolism of the blood and tissues. When this gland is extirpated in animals, notably in carnivora, the condition called *cachexia strumipriva* is set up, characterised by disorders of the nervous system, in the respiration, circulation, and in the bodily nutrition.

Treatment.—To Dr. Murray of Newcastle belongs the honour of introducing to the profession the use of an extract of the thyroid glands of sheep in the treatment of myxœdema. He injected the extract hypodermically. Injection was often followed by abscess, and other methods of introducing the drug are now employed. Thus a quarter of a sheep's thyroid, finely minced with scissors, is given by the mouth, with a little brandy and water; or thyroid tablets, two to four, thrice daily; or a glycerin extract, 10 minims. A favourite preparation is the dried powdered gland. This is now official in the B.P. as thyroideum siccum. It is well to commence with small doses as 1 gr. t.i.d., which may be gradually raised to 4 or 5 grs. t.i.d. To prevent a relapse the patient must continue the gland in smaller doses.

The results of this treatment are heightened metabolism. Increased diuresis and moisture of the skin follow; the subnormal temperature becomes normal; the face and hands assume a natural appearance; the unwieldiness of the body and the inactivity of the mind are replaced by decreased weight and mental alacrity, and in course of time the patient becomes an active and intelligent member of society.

EXOPHTHALMIC GOÎTRE

(Graves' Disease, Basedow's Disease)

This affection was first described by Dr. Graves, Dublin, in 1835, and by Dr. Basedow, Germany, in 1840. It occurs much more frequently in women than in men, and mostly between the ages of fifteen and thirty. Usually the history of the case reveals a neurotic tendency, as shown by a family history of hysteria, epilepsy, or mental disease. As a rule the affection sets in gradually, but in some cases it follows rapidly on a severe nervous shock or sudden fright.

Symptoms.—There are three cardinal symptoms, which appear in the following order:—1*st*, Increased action of the heart, at first occasional, afterwards constant, the number of beats reaching at times 140 in the minute, or even more. 2*nd*, In a month or so afterwards prominence of the eyeballs appears, varying in degree; and this prominence is most apparent during the menstrual period and when the patient is excited. In some instances merely a staring, glistening expression is observed, in others a wide space is seen between the corneal margin and the edges of the eyelids. The vision is normal. Graefe noted that when the eyeball is moved downward, the upper lid does not follow it as in health. This is known as Graefe's sign. *3rd*, Swelling of the thyroid body, symmetrical or more marked on one side, usually the right; the size is never so great as in the endemic form of the disease. A thrill and murmur may sometimes be detected.

Other symptoms supervene, as irritability of temper, tremor, increased temperature, and perspiration; yet the affection is not fatal.

The pathology of this disease is uncertain. Formerly it was held to depend upon some change in the lower sympathetic ganglia in the neck. In some cases the ganglion cells are found to be diminished, and the connective tissue increased. French observers also claim to have seen much improvement follow excision of the ganglia. More recently it has been suggested that the condition is an auto-intoxication depending on excessive secretion of the thyroid gland. Exophthalmic goître would thus be the opposite of myxœdema, which results from deficient thyroid secretion. In support of this theory is the fact that administration of thyroid gland is not only powerless to control the symptoms, but in some quiescent cases, as in one under my charge, brings on active symptoms as increased rate of pulse and swelling of the gland. These symptoms again disappeared on stopping the thyroid treatment.

Treatment.—In many cases the disease tends to improve as time goes on. Such improvement, however, is very slow, and many drugs have been tried to control the symptoms. Thus belladonna in the early stages is said to do good. Digitalis is, as a rule, useless. Brunton has seen improvement from saccharated solution of lime. Others advocate alternating courses of quinine and iron. Galvanisation of the sympathetic nerve in the neck is sometimes followed by marked reduction in the pulse-rate and in the exophthalmos. In many cases, however, drugs prove useless, and recourse is had to operation. Excision of the thyroid gland has given the best result, but is not without danger. In France the sympathetic nerve has been cut, and the lower ganglia excised, with benefit.

DISEASES OF THE SUPRA-RENAL GLANDS

The function of the supra-renal glands is still obscure. It is possible that they, like the thyroid gland, have an internal secretion which plays some obscure part in the metabolism of the body. The glands normally contain an alkaloidal substance which acts as a powerful stimulant to the circulatory and muscular systems. In fibro-caseous degeneration of the glands, causing Addison's disease, this substance is absent, which may account for the excessive feebleness and weak pulse.

ADDISON'S DISEASE—*Syn.* Bronzed Skin

While investigating diseases of the spleen, Dr. Addison noticed that a peculiar form of pigmentation of the skin, accompanied by great and progressive weakness, was associated with disease of the supra-renal glands.[1] The symptoms observed by him were great and increasing debility, a feeble pulse, faintness on the slightest exertion, loss of appetite, pain most marked in the epigastrium, but also shooting through between the scapulæ, and progressive emaciation. With these general symptoms the skin became gradually discoloured, this discoloration being most marked in the face, neck, superior extremities, penis, scrotum, and round the navel. The skin in the regions mentioned, and also on the hands, assumed a dingy, smoky hue, which in advanced cases deepened into a "bronzed" colour. So marked was this in one case recorded by Dr. Addison, "that, but for the features, the patient might have been mistaken for a mulatto." The mucous membrane of the mouth is also sometimes affected.

The course of Addison's disease is progressive, but its rate of progress is by no means uniform. Alternate exacerbations and remissions occur, and death may take place gradually, with weakness and coma, or unexpectedly, with diarrhœa and vomiting or with convulsions.

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[1] Addison's disease is never limited to one supra-renal body.

The duration of the disease is varied. Eighteen months may, however, be taken as an average.

The disease is more frequently seen in males than in females at the active period of adult life, and in those employed in manual labour. The nature of the lesion in the glands is tubercular as a rule. Tubercles form in the medullary portion which spread and involve the cortical portions. The nodules may soften and caseate, or become calcareous. There may be a great development of fibrous tissue. Sometimes there is atrophy of the gland. Rarely the disease is due to involvement by malignant tumours or pressure from aneurysms. The semilunar ganglia and branches of the sympathetic nerve may be involved by the degenerative process, and in some cases symptoms of Addison's disease seem to have been caused by the affection of the ganglia independently of any primary change in the supra-renal bodies. The opinion has thus been entertained that there is no satisfactory explanation of the peculiar pigmentation of the skin: some have regarded it as due to implication of the nerve-centres, and others, with more likelihood, to a blood change, due to disordered metabolism.

Treatment.—This is in the main symptomatic, tonics and stimulants being used to combat the debility and bismuth to control the diarrhœa. In some cases administration of supra-renal glands, either fresh or in the form of extracts, has proved successful in checking the disease.

DISEASES OF THE SPLEEN

The spleen, situated in the left hypochondrium, weighs about six ounces; its length is five inches, and its breadth rather more than three inches. Its external surface is convex; its internal border, which is concave, is in relation with the cardiac end of the stomach, and has a vertical fissure—the hilum—at which apertures are found for the entrance and exit of vessels and nerves. It has no excretory duct, and its exact purpose in the system is as yet undetermined.

Composed essentially of an elastic fibrous framework (trabecular tissue), of Malpighian corpuscles, and of spleen-pulp, it may become distended with blood from slight causes, especially from those which interfere with the action of the skin, the liver, or the kidneys. These causes continuing, its elastic power may be lost, and it thus becomes unable to send the accumulated blood onward. It may thus suffer from passive congestion. Emboli are apt to lodge in the spleen in the course of typhus fever or pyæmia, giving rise to what are termed "hæmorrhagic infarctions." These infarctions are observed at post-mortem examinations as wedge-shaped masses, with the base towards the surface of the organ. Sometimes their previous existence may be detected by a depressed cicatrix; but in pyæmia they break down into a purulent fluid and give rise to general inflammation of the organ. Lardaceous disease of the spleen is common; or serous and hydatid cysts may form within it. If portal obstruction exists, enlargement of the spleen is a necessary consequence.

The most common form of splenic enlargement, leading to hypertrophy of its tissue, follows the fevers of tropical climates, and is known as "ague cake," which has been described at p. 98.

DISEASES OF THE LYMPHATIC SYSTEM

There is no essential difference between the lymphatic and lacteal systems, which together constitute the absorbent system. The majority of the diseases to which the lymphatic system is liable, arise as the result of the passage into the lymph-vessels of some substance foreign to them, as micro-organisms, tumour cells, and the poisons of certain diseases. Thus the inguinal lymph-glands are *inflamed* in syphilis, the glands of the jaw in diphtheria, and the axillary glands in poisoned wounds of the arm, the bronchial glands in pneumonia, the mesenteric glands in typhoid fever. On the other hand, a change in the gland of the same nature as the source from which the foreign substance has come, is observed when the bronchial glands become tuberculous as the result of phthisis, and the axillary glands are cancerous in consequence of carcinoma of the breast. Under certain circumstances the lymph-vessels are also involved in lymphangitis, which involves the vessels between a wound and the nearest lymphatic glands. This inflammation either goes on to suppuration or subsides as the primary cause is removed or becomes a chronic induration. Under this section we will only take up tuberculosis of the mesenteric glands and lymphadenoma, or "Hodgkin's disease."

Tabes mesenterica is an old name for tubercular enlargement of the glands of the mesentery and retroperitoneum. The glands enlarge and may calcify; more rarely they suppurate. The condition may be secondary to tubercular disease of the intestine, or may arise from the passage of the bacilli through the normal intestinal wall.

The cases without primary intestinal lesions occur mostly in children. Nutrition is seriously interfered with, and the patients are puny and wasted; the abdomen is enlarged and tympanitic; diarrhœa is a constant feature; the stools are thin and offensive. General wasting and weakness are the most characteristic features, the fever being moderate. A large number of cases prove fatal; but it must be remembered that, even after severe symptoms, recovery may take place, the glands becoming calcareous and inert.

Diagnosis.—Tabes mesenterica, tubercular peritonitis, and chronic indigestion with diarrhœa, are popularly spoken of as "consumption of the bowels." Of these the last is most common; the first is comparatively rare in an uncomplicated form, but is frequent in connection with tubercular peritonitis. If associated with tubercular peritonitis, the abdomen is large and hard and nodules may be felt; but in tabes, the detection of the enlarged glands is difficult, owing to the distended condition of the bowels. Its existence may, however, be inferred if there be continued increase of temperature and a tubercular family history, and if the symptoms persist in spite of such changes in the diet as would in all probability rectify indigestion with diarrhœa.

Treatment.—Cod-liver oil given by the mouth tends to aggravate the diarrhœa, but when rubbed in by the palm of the hand into the front and sides of the abdomen, the bowels are not affected and the gain to nutrition is very marked. After half an ounce has been rubbed in, a flannel roller should be bound over the abdomen. Over this, covering it at all points, is applied a broad piece of moderately strong mackintosh sheeting. The friction should be continued night and morning for four or five days. The *diet* should consist of food calculated not to increase the diarrhœa, as milk in moderation with animal food. Change of air to the country or seaside is attended with great benefit.

LYMPHADENOMA—(*Synonym*, Hodgkin's Disease).—The affection now to be considered has been termed "Hodgkin's disease," because that physician first drew attention to the morbid processes in question as a separate form of disease. In later times it has been called malignant lymphoma, lymphosarcoma, adenia, and pseudo-leukæmia. The disease has been confounded with leukæmia, but the clinical history differs, for in lymphadenoma disease there is no increase in the white corpuscles of the blood, and its course is comparatively rapid, lasting only from a few months to a year or two.

The disease generally begins with a slight and painless swelling of the lymphatic glands of the neck, of one or both sides, and this swelling gradually increases until regular chains of swollen glands are formed from the angle of the jaw to the clavicle. Later on, the inguinal and axillary glands are attacked, and finally the whole lymphatic apparatus, including the spleen. The glands are at first quite distinct, and freely movable under the skin. As the disease advances, however, they become adherent and form large masses, which may cause the most diverse pressure symptoms. The glands appear enlarged and soft from hyperplasia, or they may be hard and fibrous. The splenic enlargement may be due to hyperplasia or to lymphoid tumours. The lymphatic tissue in other organs may be increased. In a case which came under my observation in 1879, the disease was accompanied, and in fact ushered in, by profuse bleedings from the nose, which recurred at intervals. There was latterly intense dyspnœa, probably through the enlargement of the bronchial glands compressing the bronchi. There was excessive palpitation of the heart on sitting up, also an anæmic murmur, and gradually increasing pallor. Diarrhœa came on towards the end, and the temperature, which had been below the normal standard, rose during the last few days to 102° F. The man finally sank into a comatose state, and died six months after admission to the hospital.

Treatment.—Arsenic is the only drug which is of much use in this disease. Phosphorus, potassium iodide, bone marrow, and spleen extracts have little effect. Removal of glands is advocated while the disease is still local.

DISEASES OF THE BLOOD

ANÆMIA

Anæmia may be defined as a reduction in the amount of blood as a whole, or of its corpuscles, or of certain of its more important constituents, such as albumen or hæmoglobin. Its evident and significant signs are pallor, particularly of the face, and a bloodless condition of the lips, gums, and finger-nails. Various forms of anæmia have been recognised, but from a practical point of view they may be grouped under three grades: (1) Secondary or symptomatic anæmia; (2) Chlorosis; (3) Pernicious anæmia.

1. Secondary or Symptomatic Anæmia.—The decrease of the quantity of blood may be *direct*, *i.e.* due to some hæmorrhage from the lungs, stomach, bowels, or uterus; or it may be *indirect*, caused by deficient supply or faulty assimilation of food, as in convalescence from febrile and acute diseases, and in many chronic complaints connected with the organs of digestion. *Indirectly*, also, pallor is associated with loss of albumen in chronic kidney diseases, and with considerable effusion into the pleura, pericardium, and peritoneum.

Extreme pallor may be due to causes acting *temporarily* or *permanently* on the circulation. The *temporary* effect is seen in the emotional influences, as terror or anxiety, which blanch the face, and depend on a feeble action of the heart, resulting in unfilled capillaries; or when the effect, though still temporary, proceeds further, and terminates in a swoon through abrupt cessation of cardiac action. The *permanent* is evidenced when, consequent on mitral disease, the pulmonary vessels become enlarged, and thus leave the heart with less blood to propel through the system; and in consequence a pale characteristic yellow hue spreads over the skin. The blood is pale and thin. There exists a constant proportional relation between the number of red corpuscles and the amount of hæmoglobin. They diminish relatively during the course of the disease, and increase relatively during recovery, the iron being deficient as to the whole blood and each cell relatively.

2. CHLOROSIS.—Chlorosis is a disease affecting nearly always the female sex, occurring at puberty or adolescence, and characterised by a great diminution in the amount of hæmoglobin, with or without diminution in the number of red corpuscles. The deficiency in the hæmoglobin leads to diminished oxidation and symptoms of chronic anæmia. There is extreme pallor. The complexion may vary from a dull transparent white to a greenish tinge. The lips are bloodless. There is, as a rule, rather plumpness than emaciation. The patient is listless, and on the slightest exertion suffers from palpitation and breathlessness. Various digestive troubles are complained of. There is usually loss of appetite and dyspepsia. Severe constipation is common. The pulse is soft, full and regular, but the slightest exertion or excitement causes it to become very rapid. On auscultation soft blowing hæmic murmurs, systolic in rhythm, are heard all over the cardiac area. They are, as a rule, more intense towards the base, and are best heard over the pulmonic area. If the stethoscope be applied over the external jugular, just above the inner end of the clavicle, a loud continuous venous hum, varying in intensity, may be heard. From its resemblance to a Parisian toy called "diable," this hum is usually termed "bruit de diable."

Examination of a drop of blood shows it to be paler than normal. The number of red corpuscles may be nearly normal;

usually, however, it ranges between 2 and 4 millions per cubic mm. Hæmatoblasts are present. The chief change is shown by the hæmoglobinometer. As a rule the hæmoglobin is reduced to 30-60 per cent.

Etiology.—Many different theories have been put forward to explain this condition. Virchow thought that it was due to congenital narrowness of the aorta and arterial system. According to Sir Andrew Clark the condition is one of auto-intoxication. Owing to the obstinate constipation excessive absorption of toxins takes place from the alimentary canal which breaks down the red corpuscles. Bunge considered that abnormal formation of sulphides in the intestine reduced the iron in the food, and rendered it incapable of absorption. Others again refer the condition to deficiency in the blood-forming organs. Lloyd Jones thinks that the changes are merely an exaggeration of what normally occurs in girls at puberty. Recent researches by Stockman show that in the diet of chlorotic patients there may be insufficient iron to replace the amount lost in the excretions. It is easily seen how the direct loss of blood, associated with the onset of menstruation, would intensify this deficiency. According to this view, chlorosis might be due to (1) excessive loss of blood by menstruation, or (2) to insufficient ingestion of iron from faulty diet or other causes leading to impaired appetite, as dyspepsia, confinement in close rooms, unhealthy occupations, etc.

3. PERNICIOUS ANÆMIA (Idiopathic anæmia), affecting equally both sexes between the ages of twenty-five and forty, is a form of chronic anæmia characterised by great diminution of the number of red corpuscles. Its origin is obscure. No primary cause may be detected, but in most cases pernicious anæmia is secondary to gastro-intestinal affections, as atrophy of the gastric mucous membrane, chronic diarrhœa, or it may follow pregnancy, prolonged lactation, cancer, etc.

Symptoms.—For weeks or months, without any obvious cause, the patient loses strength and becomes paler, but the pallor, unlike that of ordinary anæmia, is of a yellowish tint and not waxy white. There is little emaciation with the anæmia, yet the patient is breathless and disinclined for any bodily or mental exertion. A loud and persistent cardiac murmur can in some cases be detected, and the urine is usually highly coloured and free from albumen. It may contain a normal quantity of urea and uric acid as well as indican. The pupils are mostly dilated, and the retinæ show on ophthalmoscopic examination small hæmorrhages which are most numerous round the optic disc. The blood is pale and watery. The number of red corpuscles may fall to 10 per cent of the normal, or lower. The individual corpuscles show great irregularity in shape and size. A feature of this form of anæmia is the presence of fever, which may give a temperature of 101° to 103°. This fever is, however, irregular. It may be absent for days together, and the temperature is often subnormal before death. The prognosis is unfavourable, though temporary improvement is frequent. Dr. Pye Smith has collected twenty cases of recovery as compared with one hundred and three fatal cases. Of the fatal cases a large number die in about six months, others last twelve or thirteen months. The fatal termination is sometimes due to syncope, but usually it is slow and gradual, with delirium and insensibility before death.

At the post-mortem the most constant conditions observed are fatty degeneration of the heart, liver, kidneys, and hæmorrhages into the serous membrane of the endocardium, the mucous membrane of the stomach, the retina, the lungs, the surface of the brain, and other parts. An abundant deposit of iron is found in the cells of the liver and the spleen. The marrow of the long bones is abnormally red.

Treatment.—In anæmia and chlorosis the bowels are usually constipated, and treatment should begin with an aperient mixture as decoctum aloes co. (F. 25). After its action has been manifested iron should be prescribed. In chlorosis any preparation of iron is efficacious; the freshly prepared pil. ferri is often prescribed. The citrate of iron and quinine and ferrum redactum are useful preparations. For the derangements of digestion which exist, it is rarely necessary to give any special medicine; for these derangements are simply symptoms of the disease, and the pill should be prescribed at once in the following manner. Begin with three pills daily and continue by the addition of one pill daily, until eighteen are taken. Then decrease by one daily until the original number of three is reached.

If during their administration menstruation appears, then for this period discontinue them, but when it has ceased proceed as before. So administered this pill works admirably, the lips and gums testify to the operation of iron on the system, for they assume the colour of health and the anæmic murmur disappears. Yet although perfect health seems to have been restored it is absolutely necessary to guard against a relapse, which may occur, and accordingly the pill thrice daily should be continued for three or four months. When hysteria is associated with chlorosis massage is a useful adjunct to the iron treatment, and it may be necessary also to insist on the feeding recommended by Dr. Weir Mitchell.

In SECONDARY ANÆMIA, as in recovery from acute disease or from hæmorrhage or from general debility, the tincture of the perchloride of iron is most serviceable. If derangements of digestion occur from its use, one of the scale preparations of iron should be substituted for it, or saccharated iron in 2 or 3 grain doses thrice daily. To correct constipation, if present, a pill of aloes and myrrh is preferable to any other form of aperient medicine; but if diarrhœa, not constipation, exists, the subnitrate of bismuth in a 10-grain dose thrice daily is usually sufficient to check it. For patients who are anæmic without any other complication, and who can afford to leave their homes, the chalybeate springs of Schwalbach, Spa, Pyrmont, the Luisen of Homburg, and St. Moritz can be highly recommended during the summer and autumn months. These springs contain carbonate of iron and carbonate of sodium, and the therapeutic value of this combination is enhanced by fresh air, pleasant society, and agreeable surroundings. If there be chronic intestinal catarrh with anæmia the alkaline waters of Franzensbad, Kissingen, or Tarasp prove highly useful. In PERNICIOUS ANÆMIA iron seems to have no effect, and other tonics are of little service. Arsenic is the only medicine which appears to exert a beneficial influence, and it should be given in gradually increasing doses, as liquor arsenicalis 3 minims thrice daily and increasing the dose every five or six days first to 5 minims, then to 10, then 15, and finally 20 minims. Bone marrow has been occasionally found advantageous after arsenic had failed. Special symptoms should be met as they arise.

Leukæmia.—This affection was designated "Leucocythæmia" by Dr. Hughes Bennett, but it is now generally termed "Leukæmia." It consists essentially of a great increase in the proportion of white corpuscles of the blood; and these corpuscles, when the blood is placed under the microscope, occupy nearly the whole field in the proportion of one to ten, one to five, or one to three. Their size varies; some are large with two or three small nuclei; others are smaller with one nucleus nearly occupying the cell. On the other hand, the red corpuscles are less numerous than in health.

Etiology.—The disease occurs in men much oftener than in women, and mostly at middle life. It is sometimes observed in young children. The cause of the disease is obscure, and no satisfactory evidence has been furnished as to its production.

Symptoms.—One of the first signs is enlargement of the abdomen, through hypertrophy of the spleen, which may have been enlarging for some time without any constitutional sign. When an examination is made it may then be found to be a firm hard tumour occupying the whole left side of the abdomen. The liver also enlarges to the extent of two or three inches, and in some cases the lymph-glands in the neck, groin, and axilla are involved, being moderately large, and not very hard. When the spleen is already very large, there may be no outward signs of anæmia, but later on the patient loses colour, and becomes sallow or very anæmic. The temperature is generally affected; there is continued pyrexia or periods of pyrexia alternated with periods of apyrexia. The altered conditions of the blood give rise to dyspnœa and hæmorrhages. The hæmorrhages take the form of epistaxis, bleeding from the gums and mouth, and purpuric spots under the skin; occasionally there is bleeding from the lungs, stomach, intestines, kidneys, or uterus. Albumen is rarely detected in the urine, but indican is often present. The disease lasts from one to two or three years, and towards the end the pallor increases with ascites and hydrothorax, and finally death occurs from intercurrent affections, as pleurisy, pneumonia, or cardiac failure from dilatation.

Treatment.—Quinine and iron do not appear to be of any use, and most reliance is to be placed on the persevering use of arsenic. The inhalation of oxygen and the administration of phosphorus, potassium iodide, and extracts of spleen, thymus gland, and bone marrow, have also been used.

HÆMOPHILIA.—In certain families the males, during successive generations, are liable to protracted and even fatal hæmorrhages after injuries of no great severity. Such families are termed "bleeders." Though the hereditary tendency is unquestioned, and the proportion of males to females is given as thirteen to one, yet the inheritance of the complaint takes place mainly through the female line. The sons in a family in which it exists do not always all suffer, but the daughters of such a family, even when they themselves have shown no tendency to hæmophilia, are almost certain to transmit it to their male children.

Course and Symptoms.—About the end of the first year, or at least before the second year, definite symptoms generally appear. Spots and patches of effused blood are observed, without any apparent injury. Epistaxis is the most common form of mucous hæmorrhage, especially in children. Next comes bleeding from the mouth and gums. These may be considered as spontaneous or quasi-spontaneous forms of hæmorrhage, and are in marked contrast with those which occur from blows, cuts, or even scratches, when blood may be lost to such an extent as to endanger life. The extraction of a tooth gives rise to a remarkable amount of hæmorrhage. The deeper structures may also be the seat of extravasation of blood, especially upon the thigh, where the slightest blow may fill the connective tissue with blood from the knee to the trochanter. As a rule such swellings, if not interfered with, slowly subside. *Articular implication* usually begins between the seventh and the fourteenth year, and is observed, especially in the knee-joint, as the result of a blow or following on a long walk. The enlargement often increases rapidly, and appears precisely like that which might be due to rheumatism or synovitis. The usual course of the swelling is slowly to subside under treatment, but to return again and again at intervals of months or years.

Prognosis.—By far the largest number of those affected with hæmophilia die before they are eight years old. When adult life is reached the danger is lessened, but it is by no means at an end, for a fatal bleeding may occur as late as fifty or sixty years of age. The quantity poured forth is sometimes enormous. Thus half a gallon is stated to have been lost in the twenty-four hours from the extraction of a tooth, and it often happens that oozing may go on at the rate of three or four pints a day for several days. As the bleeding goes on the patient becomes pale, bloodless, delirious and unconscious, and death is often preceded by convulsions.

Pathology.—The most probable explanation seems to be imperfect formation of the vascular system, and impaired power of coagulation on the part of the blood. Wright finds that the blood in hæmophilia coagulates very much slower than normal blood, and the resulting coagulum is imperfect.

Treatment.—The diet should be light and stimulating, and thus "a considerable proportion of white meats" is recommended by Jenner, with an aperient dose of sulphate of sodium every week, and pil. hydrargyri every third week. Dr. Legg advises the taking of the tincture of the perchloride of iron, and residence in a warm dry climate. When actual hæmorrhage occurs, ergot or gallic acid should be given. Locally there is no styptic so valuable as the tincture of the perchloride of iron. Wright gives calcium chloride in 25 to 30 grain doses to increase the coagulating power of the blood.

SCURVY

Scurvy is a disease alluded to by the earliest medical writers, who failed however to grasp its nature. Certain *causes*, as bad food, great privation, a marshy soil, and insanitary dwellings, may predispose to scurvy, but the real, essential cause is the *want of a fresh vegetable diet.* Although at different times it has proved very fatal to armies in the field, yet it is pre-eminently known as a sailor's disease.

Pathology.—Explanations as to the precise nature of the alterations of the blood and tissues which precede and accompany the development of the disease, have been given by Garrod and Ralfe. The former considers that scurvy depends upon a deficiency of potassium in the system, and the latter is of opinion that the primary alterations seem to depend on a general alteration between the various acids, inorganic as well as organic, and the bases found in the blood, by which (*a*) the neutral salts, such as the chlorides, are either increased relatively at the expense of the alkaline salts; or (*b*) that these alkaline salts are absolutely decreased. This condition produces diminution of the normal alkalinity of the blood, and leads to dissolution of the blood corpuscles, ecchymoses and blood-stains on mucous surfaces, and fatty degeneration of the muscle of the heart, the muscles generally, and the secreting cells of the liver and kidney. It is noteworthy that the administration of large quantities of beef-tea which contains a very considerable quantity of potassium, or of salts of potassium, fails to exercise a curative effect in scurvy. This fact diminishes the value of Garrod's theory, and supports the conclusion of Ralfe.

Symptoms.—The symptoms of scurvy are well marked, as is shown in the following description by a friend, who was surgeon to a whaling-ship when a very serious outbreak of the disease arose from a defective diet. "The men were listless and dispirited before there were positive indications of scurvy. They could scarcely drag their legs along, and were unable to go aloft, or, if they did so, this was attended with great pain and marked debility. The pain seemed rheumatic in its character, and was always worst at night. The countenance was sallow and muddy long before the actual manifestation of the disease. The pain was at first confined to the extremities, and upon these the effusions of blood first occurred, generally in the form of small petechiæ, which afterwards developed into vibices, and sometimes into ecchymoses. A bruise, a rebound from a rope, or any small injury occasioned a steady development of an ulcer. Sometimes there was extensive and diffused infiltration beneath the subcutaneous and intermuscular areolar tissue. The gums became spongy, livid, and swollen, and bled easily. The teeth became loosened.

"The limbs, especially the calves of the legs, then became as hard as a board, while above the induration the skin was either immovable and unaltered in colour, or had blood effused under it.

"When a fatal termination ensued, it either did so from extreme exhaustion or general dropsy, unless the patient was cut off at an earlier stage by pleurisy, pericarditis, or profuse bloody diarrhœa."

Treatment.—The treatment is essentially dietetic. The patient should be confined to bed. The diet should consist of milk soups and a liberal allowance of fresh vegetables and fruit, as potatoes, green vegetables, oranges, lemons or fresh lime juice in doses of one ounce thrice daily. Chlorate of potash lotions may be used for the mouth; and as soon as the condition of the gums permits, fresh meat should be added to the diet.

The carrying out of the recommendation to administer lime juice in ounce doses daily in ships going on long voyages has reduced the frequency of scurvy by 80 per cent. In a number of cases investigated by me lime juice in double this dose failed to prevent scurvy.

INFANTILE SCURVY OR SCURVY RICKETS.—Barlow has recently called attention to a form of scurvy which occurs in rickety children. The first symptom is tenderness in the legs. These become so tender that whenever the child is moved it commences to cry. While at rest the limbs are kept motionless, and the child seems to be in comparative comfort. The lower limbs are seen to be swollen, especially at the joints: this is due to sub-periosteal hæmorrhage. The pain and swelling is usually limited to the lower portion of the thighs, knees, and legs, though the arms may be occasionally affected. The skin may show petechiæ and ecchymoses. Moderate fever and severe sweating are usually present. If the child has teeth the gums may be spongy. The eyes may also be affected. *Treatment* consists in immediately overhauling the child's diet. All patent food stuffs should be stopped and fresh milk given. To this may be added fresh meat juice or mashed potato. Lemon juice may be given. The improvement is very rapid.

PURPURA

Owing to causes not fully understood, ruptures of the smaller cutaneous vessels, giving rise to effusions of blood, may occur during the course of various infective diseases, pregnancy, Bright's disease, syphilitic conditions and in debility due to poverty and bad hygienic surroundings.

The blood thus escaped from the capillaries is seen as circular spots, varying from the size of a pin's head to that of a pea, being apparent first on the legs, afterwards on the trunk. They are unaltered by pressure, and have no tendency to coalesce, unless exposed to pressure, when they seem to run into one another, causing vibices or ecchymoses. In their first or circular form they are termed petechiæ.

Purpura is usually ushered in with slight fever, and with the other usual concomitants of this, viz. thirst, headache, and quick yet compressible pulse. In other instances the premonitory symptoms may pass unnoticed. Not merely does the skin suffer as described, but blood may also transude into the several mucous, and occasionally also into the serous, membranes of the body. In these effusions lies the chief danger of purpura, and the disease has thus two great divisions :—

Purpura Simplex and *Purpura Hœmorrhagica.*—In *purpura simplex* the disease runs a simple course, with little constitutional disturbance. A few spots are probably found dispersed over the body on awakening in the morning, but not aggregated. Two or three successive crops may thus form; and the disease usually subsides in from seven or eight days to a fortnight.

Purpura Hœmorrhagica is an aggravated form of the simple disorder, and in addition is specially characterised by an effusion of blood into those passages of the body lined with mucous membrane. Consequently, effusions are observed during life on the gums, tongue, and inside of the cheek; and, if the case ends fatally, they can be seen all over the digestive tract.

Necessarily, the constitutional symptoms are more intense, the fever higher, the general oppression more apparent than in the other form; and, in from twenty-four to forty-eight hours, spots are rapidly developed on the skin. These spots are of a bright red colour at first, but deepen into a purple red. The skin becomes tender and blotched, and scratching occasions bleeding.

The same exudation may take place into the mucous membranes from the first, but it usually follows after a few days. Oozing of blood, which it is sometimes difficult or impossible to check, may occur from the gums, while from the same cause there may be epistaxis, or hæmorrhage from the lungs, stomach, or bowels. Thus there may be great and fatal loss of blood, or simply weakness, anæmia, and pallor.

Diagnosis.—Purpura and scurvy may be confounded with one another. They agree in this, that they are due to some impoverished state of the blood which leads to effusion. They differ, however, as will be observed, in certain points.

Scurvy appears gradually, purpura suddenly and with some premonitory feverishness. Scurvy is essentially characterised by sponginess and lividity of the gums, while these conditions are absent in purpura. A dusky sallow complexion accompanies scurvy, but not purpura. Further, scurvy is due mainly to the want of fresh vegetables, and can be cured by the administration of these.

No single error of diet, no single cause, originates purpura, and it can neither be prevented nor cured by the antiscorbutic remedies.

Treatment.—Ignorant of the cause, we can only treat purpura symptomatically. We have no specific, as in scurvy; yet, knowing that poverty, bad diet, fatigue, and defective ventilation are great predisposing causes, it is obvious that a good nourishing diet, rest, and a well-ventilated room are essential.

Ten or twelve drops of dilute sulphuric acid, combined with one grain of quinine, may be given every two hours, or

F. 75. Tincture of the perchloride of iron in large doses seems specially serviceable in Purpura Hæmorrhagica.

When hæmorrhages from mucous surfaces are present, absolute rest should be insisted on, turpentine given in the form of a capsule, and when the hæmorrhage is great the hypodermic injection of ergot may be resorted to several times daily. Easton's syrup in a 30-m. dose thrice daily aids convalescence.

Diet.—This should consist of milk and cold beef jellies. Stimulants are to be given with caution.

OBESITY—*Synonyms*, CORPULENCE, POLYSARKIA

This condition may be conveniently considered here, although it does not, strictly speaking, come under the affections of the blood. Obesity is characterised by an extensive development of adipose tissue, more especially in those situations where normally it is abundant, viz. subcutaneous, subserous, and intermuscular connective tissue, which leads to various disturbances in the bodily function.

As predisposing causes to obesity may be mentioned heredity, age, and sex. Excessive corpulence is more common in women than men, and generally occurs at the "change of life," viz. 40 to 45 years. Race and climate also play their parts in obesity. The Hottentot, the Hindoo among Eastern races, the German, the Jew, and the Greek, of European races, become obese. While predisposing causes must be borne in mind in considering obesity, yet without doubt determining causes are more potent factors. Thus, excess of food and especially excess of drink in any form will lead to corpulence in those who are hereditarily inclined to it, or who are prevented by occupation or business from taking sufficient exercise to promote the oxidation of the tissues.

The fat of the body of an average male adult constitutes about one-twentieth, and in the female rather more, of the total weight; but in extreme cases of obesity one-half or four-fifths of the body weight may be fat. The symptoms of obesity need scarcely be alluded to, except in so far as they bear on the treatment of the disease. These are diminution of muscular energy, hence the dislike for bodily exercise; impairment of the powers of digestion, evidenced by flatulence or acidity, constipation, or diarrhœa; a slightly saccharine condition of the urine, which is due to deficient oxidation; and a general weakness of the circulation, which tends to the formation of hæmorrhoids. Hippocrates pointed out that "corpulence is not only a disease itself, but the harbinger of others." The obese person, even more than the person of spare habit, is liable to be attacked by catarrh of the respiratory and alimentary mucous membranes, and if subjected to an acute disease the prognosis is grave.

In obesity death by syncope may result from an extremely fatty heart; from cerebral hæmorrhage, caused by rupture of an atheromatous vessel on the brain; or from pulmonary congestion with general œdema, from cardiac dilatation.

Treatment.—Avoiding anti-fat nostrums, the corpulent person should carefully study diet. He should not take fatty and starchy food. Lean meats, sweetbreads, fish, except salmon and eels, clear soups, poultry, eggs, game, cheese, green vegetables, toast, gluten bread, fresh fruit, and pickles are allowed. On the other hand, potatoes, sweets, sugar, carrots, and fat meat should be eschewed.

The less liquid taken the better; even water should be drunk in small quantities, and not with, but after, meals, say half to one hour. Alcohol in any form, but especially as beer, porter, champagne, port, and fruity wines, increases corpulence. Tea and coffee are supposed to interfere with tissue change, and therefore should be taken sparingly. The same remark applies to milk, which to a great extent is inadmissible from the fat which it contains. An average diet for a fat person would be 12 oz. lean meat, 6 oz. rusks or toasted bread, 4 oz. green vegetables, 1 oz. butter, and 1½ pint tea.

The dietary given was the basis of the treatment of Banting, but since his time two other methods have come into vogue: (*a*) Oertel's consists chiefly in a marked restriction of the quantity of liquid taken, and enforcing exercise at first on level ground, and then on gradually increasing gradients; (*b*) Salisbury's consists in an unlimited amount of meat food, with complete abstinence from fats, starches, and sugars, and with such regimen a large allowance of hot water is insisted on, not with food, but *two* hours afterwards. Ebstein allows his patients a moderate amount of fat in the shape of fatty meat and butter, as with this addition the reduction of carbohydrates is easier borne. As bearing on all treatment the observation of Celsus is suggestive "that bodily exercise will undoubtedly prove very advantageous, as we see fat horses getting lean by heavy work. Thus, likewise, those will never get fat who are obliged to toil with heavy labour."

Of medicines, iodides and alkalies are sometimes prescribed in large doses. Thyroid extract is occasionally useful.

Mineral Spas.—Marienbad in Bohemia, with its alkaline aperient waters and restricted diet, can be highly recommended ; also, but to a less extent, Carlsbad, Kissingen, and Homburg.

DISEASES OF THE KIDNEYS

Healthy urine on exposure to air undergoes a series of changes, which should be clearly understood. First there occurs a precipitation of the amorphous urates, then of uric acid, and sometimes oxalate of lime. After a variable period *acid fermentation* takes place, and this is probably due to the formation of lactic acid. In the course of four days the acidity becomes faint, and the urine loses its pleasant odour and enters into a state of *alkaline fermentation.* Its clearness departs and turbidity ensues owing to the development of micro-organisms. The amorphous urates deposit is replaced by dark round masses of urate of ammonia, uric acid crystals give way to bright prisms of triple phosphate, and an abundant sediment of amorphous phosphate of lime sinks to the bottom of the vessel.

When the urine becomes fairly putrid the micro-organisms alluded to cease to grow.

We will, under certain headings, consider the urine in health and disease, and try to bring out the most important points to be ascertained from its examination.

1. *Quantity.*—The quantity of urine passed in twenty-four hours by an adult healthy man varies widely within normal limits, but is usually from forty-five to fifty fluid ounces. This quantity is increased in Diabetes Mellitus, Diabetes Insipidus, contracted kidney, amyloid degeneration of the kidney, in some forms of hysteria, and usually in convalescence from acute diseases. It is diminished in acute nephritis, feeble circulation, fever, and in all conditions where, from sweating, diarrhœa, or vomiting, much fluid is abstracted from the system, as in cholera and dysentery.

2. *Density of the Urine.*—The specific gravity of healthy urine is from 1·015 to 1·025, and this specific gravity is estimated by the *urinometer.* This instrument has a bulb and graduated stem; if the bulb be placed in distilled water at 60° F. it floats at the zero point of the index; in normal urine, somewhere between the figures previously mentioned.

As a general rule in disease it may be stated that when the quantity of urine is diminished its sp. gr. is raised, and an abnormal sp. gr. in the course of any disease is a fact of great importance. In failure of the kidneys to eliminate the products of tissue waste a fall of the sp. gr. is observed, which may for several days precede the access of uræmic convulsions; and a rapid decline, in the course of continued fever, sometimes precedes a fatal termination; again, if on the first examination of urine we find the sp. gr. below 1·015 we may suspect albumen, if above 1·025 there is possibly sugar.

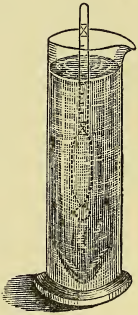


Fig. 16.

3. *The Colour and Odour of the Urine.*—Healthy urine has a pale yellow, amber, or straw colour, and a faint and peculiar odour due to the presence of certain volatile organic acids. The normal urinary pigments have as yet not been completely separated, but it is probable that they are several in number. The colour of healthy urine depends partly upon

the degree of concentration, being darker as this is more pronounced.

In fever, additional colouring matter is secreted, the nature of which is at present unknown. At some period in the course of a disease the colour of the urine may undergo a change from the admixture of blood; if this be in a small quantity a flesh colour is observed, if large it may be bright ruby-red, and in most cases it has a smoky or muddy look. Bile pigments impart a brownish-yellow or green tint, and the presence of bile may be usually detected by shaking up the urine, when a yellow foam will form upon it. Urine which contains much urobilin is always of a dark red-brown colour, and when shaken up will yield a similar foam.

Certain drugs may affect the colour of urine—rhubarb and senna give a brown or blood-red in alkaline urine; carbolic acid imparts a dark colour, if the urine be allowed to settle for a time; quinine and antipyrin also colour it more or less deeply. It may be stated in general that the urine is darkly coloured in fevers, and in congestion of the kidneys, from heart disease, emphysema, and chronic bronchitis. In cancer, affecting the intestinal canal, it is apt to be dark and pigmented, and in such a case an excess of indican may be determined.

On the other hand, it is deficient in colouring matter in Diabetes Mellitus and Insipidus, chronic nephritis, hysteria, and anæmia.

4. *The Reaction of the Urine.*—Healthy urine is as a rule acid, and this acidity depends mainly on the acid salts (chiefly acid phosphate of sodium) which it contains. The acidity is generally less marked in the forenoon than at any other time, and the urine of a healthy person may at the former period exhibit an alkaline reaction.

Diet modifies the reaction, for it may be alkaline after a full meal, or after taking alkalies or the salts of the alkalies with the organic acids, the latter being converted into carbonates in the system. On the other hand, the administration of acids renders the acidity of the urine more marked in some cases. Healthy urine allowed to stand for a few days becomes alkaline in consequence of the action of a micro-organism—

the micrococcus ureæ—which is supposed to form carbonate of ammonium by the combination of the urea with water, thus—

$$CO(NH_2)_2 + 2H_2O = (NH_4)_2CO_3.$$

It also becomes cloudy and emits an offensive and characteristic odour. The urine is as a rule *acid* in febrile conditions, diabetes, abnormally so in leukæmia and scurvy; on the other hand, it is *alkaline* in cystitis, in simple and pernicious anæmia, and in chlorosis.

In 1000 parts urine we have—

	Water	954·81
	Solid matters	45·19
Solids—		
	Urea	21·57
	Uric acid	0·36
Extractives.	Kreatin, kreatinin, ammonia, hippuric acid, xanthin, hypoxanthin, sarcina, pigment, unoxidised sulphur and phosphorus, mucus, etc.	6·47
	Chlorine	4·57
	Sulphuric acid	1·31
	Phosphoric acid	2·09
	Potash	1·40
	Soda	7·19
	Lime	0·11
	Magnesia	0·12

The *normal constituents* of the urine to which for practical purposes attention must be directed are, among *organic* substances, urea, uric acid, hippuric acid, kreatinin, xanthin, oxalic acid, and the colouring matters urobilin and indican. Among *inorganic* substances, phosphates, chlorides, sulphates.

Urea.—By far the greater part of the nitrogen taken with the food is eliminated as urea. It may be considered to be the result of the metamorphosis of the nitrogenous elements of the food and tissues. Of this body 400 to 450 grains—about 8 grs. to the ounce of urine—are daily excreted by a healthy man (*i.e.* about 3½ grains per pound of body weight), but its quantity varies greatly under physiological and, still more, under morbid conditions. This quantity can be accurately determined by the ureameter (Fig. 17), and the method of doing this is described in the Appendix.

The ureameter is easily worked. It gives fairly accurate results, and careful daily testing can be recorded by an experienced nurse. Further, its use aids treatment; for in chronic Bright's disease a marked deficiency foretells uræmia, and this may be averted by pilocarpine and active cathartics. The quantity passed is increased in diabetes and in fever, notably in acute rheumatism, when the normal quantity is nearly doubled, 16 grains per ounce being a not uncommon proportion. On the other hand, it is diminished in chronic diseases attended by malnutrition and in diseases involving the proper structure of the liver, where it is elaborated. In continued fever and in the late stages of phthisis the amount of urea eliminated is of diagnostic importance, for an increased quantity in fever is a good omen, while in the late

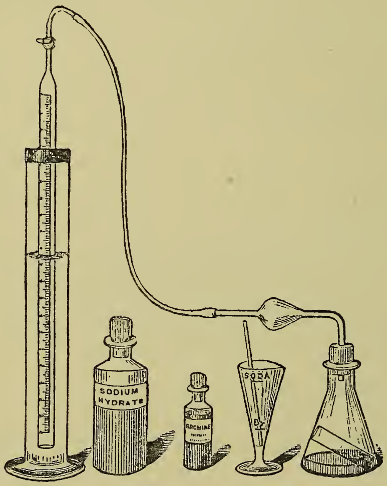


Fig. 17.

stages of phthisis a decreasing quantity indicates the advent of a fatal result.

Mode of Detection.—The presence of urea in the urine can always be shown by evaporating the urine, if of ordinary sp. gr., to about half its bulk and adding an equal quantity of nitric acid. On cooling the mixture, shining rhombic crystals of the nitrate of urea are seen through the fluid. If the urine be of high sp. gr. it is often unnecessary to concentrate it by evaporation previous to the addition of nitric acid.

Uric Acid.—In highly acid urine a crystalline deposit of uric acid may spontaneously appear, but this is rare, and for the purpose of examination it should be secured by the additon of strong hydrochloric acid to urine. This throws it out of its combination with bases, and it is then, owing to its insolubility, precipitated. When examined under the microscope it presents many different forms, but they are usually readily recognised by their red or orange colour.

The Uric Acid Diathesis.—A healthy adult excretes about 7½ grains of uric acid with the urine in twenty-four hours. This quantity is increased in health by an excess of animal food, and the urates appear as a red deposit in the vessel when the urine cools. In fever, leukæmia, pernicious anæmia, and in diseases of the heart and lungs with obstructed respiration, the quantity exceeds the normal standard.

The excretion of uric acid, on the contrary, is diminished in nephritis, gout (after the acute paroxysm), diabetes, and chronic rheumatism.

In certain cases with few symptoms except emaciation a remarkable increase of uric acid is the only real objective manifestation, and such cases undoubtedly constitute what is termed the *uric acid diathesis.*

Treatment.—In the slighter forms an antibilious pill, regulation of the diet, and the use of Vichy or Contrexéville water will act as efficient remedies. In chronic gout or chronic rheumatism it is necessary to use more potent means to aid their elimination, as ℞ Vini colchici ʒiv., potassii chloratis ʒiii., tincturæ serpentariæ ʒiii., decocti scoparii, decocti senegæ āā ʒvi. M. Sig. ʒi. every four hours.

Urates.—Uric acid forms salts with metals of the alkalies and alkaline earths, but the only urates commonly met with among the products of renal activity are those of sodium and ammonium. Deposits of urates are found in two forms, amorphous and crystalline.

Amorphous Urates.—These form a finely granular deposit of a variable colour—cream, fawn, orange, red, or pink. Along with the sediment at the bottom of the glass, a FINE FILM is seen upon the sides, which film is characteristic, and distinguishes urates from all other deposits. They are further easily recognised by the application of heat, for they then completely dissolve, and the urine is left clear. They are the *only urinary deposits* which *disappear* by the *heat test. Microscopically* amorphous urates are seen as a mass of granules, large or small, and *chemically* they consist of uric acid in combination with several bases—sodium, ammonium, potassium, and calcium. The deposit of urates has no special significance, for they are frequently formed in cold weather, and as the result of errors of diet.

Crystalline Urates.—These deposits are composed of urate of sodium and urate of ammonium. When present the crystalline urate of sodium (a grayish or yellowish deposit) points to the urine being very acid, and it is associated with gouty conditions and the fever of childhood. The urate of ammonium precipitate is invariably white in colour, and it is always accompanied by phosphates. It has no diagnostic importance.

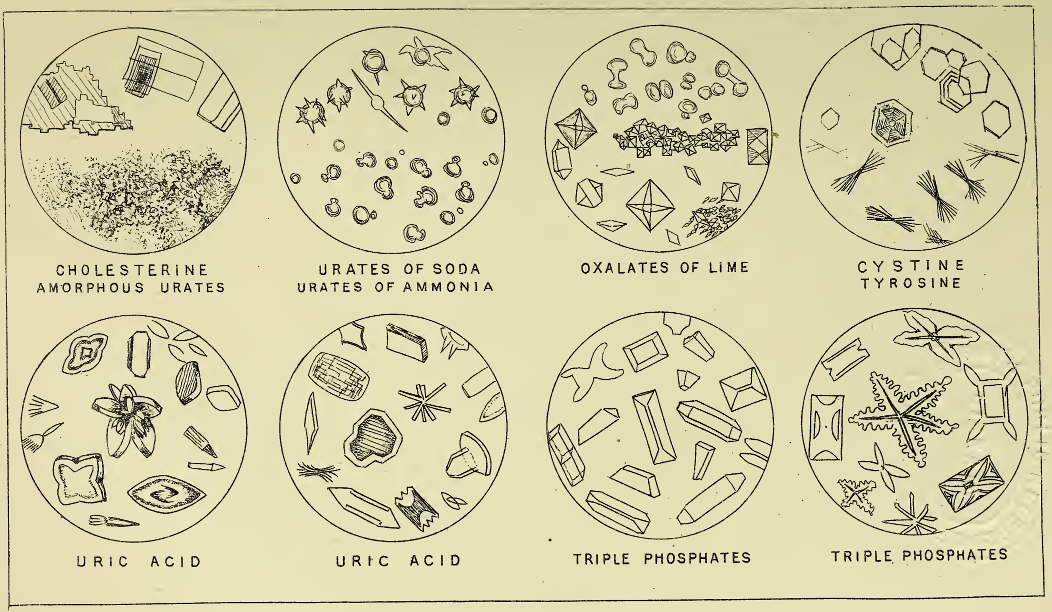
Hippuric Acid.—The amount of this acid, chiefly in the form of the sodium salt, in the urine of twenty-four hours, is from 12 to 15 grains. It is a crystalline substance, and under the microscope is seen to consist of rhombic prisms. It is increased in health by a vegetable diet, and in disease by febrile conditions and Diabetes Mellitus.

The *inorganic substances* to which it is necessary to call attention are phosphates, chlorides, and sulphates.

Phosphates.—Two kinds of phosphates are found in urine when it has become alkaline: (1*st*) amorphous phosphate of lime, (2*nd*) ammonio-magnesian or triple phosphate. These are always deposited when, through fermentation, the urine becomes alkaline. The phosphate of lime is observed as an

Pl.VIII.

CRYSTALLINE AND AMORPHOUS URINARY DEPOSITS.



amorphous deposit under the microscope, and the triple phosphate occurs in rhombic prisms. A third variety of phosphates is observed in the stellar phosphate of lime. They are rarely seen, and may for all practical purposes be considered simply as clinical curiosities, if only a few are observed; but if in quantity and continued for some days, Dr. Roberts deems them of grave import.

Occasionally from diminished acidity of the urine, due to want of exercise or excess of mental effort, the urine is feebly acid or nearly alkaline when voided; and such urine may be turbid from phosphates even when passed. This need give rise to no anxiety. Exercise and a mineral acid with a vegetable tonic, and cessation from work, will soon restore the normal acidity to the urine, and dispel the phosphates.

The quantity of phosphates is, however, increased in febrile disorders and in diseases of the nerves and bones; while it is decreased in Bright's disease and in fevers after the disappearance of the febrile symptoms.

The deceptive cloud of phosphates sometimes occurring on boiling urine is removed (as stated at p. 353) by adding to the boiling solution a drop or two of nitric acid, which at once clears up the urine. Boiling without the acid will not, however, do so.

Chlorides.—Chlorine is *present* in the urine in combination with ammonia, fixed alkalies, or alkaline earths. The quantity chiefly depends on the amount of salt taken with the food. Chlorides are easily detected by adding a solution of nitrate of silver and a drop of nitric acid to urine in a test-tube, when a curdy precipitate is formed. Their *absence* from the urine is of a clinical significance, as in the acute stage of pneumonia.

Sulphates.—Sulphur appears in the urine, as—

1. Sulphuric acid free, or in conjunction with organic radicals, or within organic basis;
2. Oxidisable sulphur compounds, as taurin;
3. Sulphur compounds oxidisable with difficulty.

For details as to the mode of detecting them the student is referred to text-books of chemistry.

Clinically the estimation of the sulphates is of importance in diagnosing the condition of the liver. The more sulphur is excreted by the bile, the less appears in the urine, and *vice versa.*

Kreatinin.—This is a crystalline base which forms highly characteristic compounds with acids. It is recognised by its oblique rhombic prisms, and the quantity of it present in the urine of twenty-four hours is from 7 to 15 grains. The quantity present is in direct relation to the amount of flesh meat consumed in food, and under certain circumstances to the muscle waste in the body. An increase is noted in acute diseases of all kinds attended with fever, and in Diabetes Mellitus; and a diminution is observed in chronic Bright's disease, Diabetes Insipidus, and in convalescence after acute diseases. *Xanthin* and other extractives mentioned as occurring in healthy urine have no special significance.

Oxalic Acid.—This acid occurs in healthy urine passed in twenty-four hours, to the extent of 0·02 grammes. An excess of oxalic acid is occasionally found in diabetes, and especially when the quantity of sugar diminishes. While our knowledge of this condition is very defective, yet there are certain complaints, characterised by pain in the back and loins, and attended with great emaciation, in which the only other objective symptom is an excessive elimination of oxalic acid in the urine. It may then be termed *oxaluria;* but the occasional occurrence of oxalic acid in the urine above the normal quantity need give rise to no anxiety, as its presence is then due to errors of diet, and yields readily to treatment by nitro-hydrochloric acid.

Pigments.—Of the normal organic constituents of the urine, the colouring matters urobilin and indican alone require a brief notice.

Urobilin is constantly present in healthy urine. When separated from urine, urobilin is a dark reddish-brown powder, readily soluble in alcohol, ether, and chloroform, but less easily dissolved in water. It is diminished in quantity in chronic Bright's disease, and increased in fever and some derangements of the digestion.

Indican as such is rarely present in the urine, but it may always be obtained from it as a product of the decomposition of salts of indoxyl-sulphuric acid. It can be detected by mixing the urine with its own bulk of hydrochloric acid, and adding drop by drop a solution of calcium chloride, until a greenish tint is produced. The indoxyl-sulphates are thus split up, and the coloured product indigo blue remains, which can be removed by shaking up with 10 centimetres of chloroform, and the colouring matter is obtained as a deposit after evaporation. There are certain diseases in which indoxyl-sulphuric acid is regularly produced in excess; and the presence of indican in the urine is very often a sign of intestinal putrefaction, and it may also accompany the decomposition of albumen in other cavities. Thus in cases of pleurisy with a large unhealthy exudation there is an excess of indican in the urine, and when this abundance arises in the course of peritonitis it may be taken as an evidence of the character of the disease and of the formation of unhealthy pus.

In the light of the foregoing statements, and from those which follow, a student in a clinical ward, and undergoing the ordeal of a clinical examination, should proceed in a systematic manner to examine a sample of urine placed before him, and should note the results in a tabular form on paper :—

1. The colour of the urine.
2. Test its reaction by litmus-paper.
3. Indicate its specific gravity by reading off the number obtained by placing the urinometer in the sample with the bulb downwards.
4. If the specific gravity be lower than normal—1·017, test for albumen by heat and nitric acid, remembering certain precautions in doing this; if higher than the normal—1·025, test for sugar with Fehling's solution.
5. Place a sample of any deposit in the urine glass under the microscope, and describe whether it is crystalline, amorphous, or composed of tube-casts, blood, or pus.
6. Then indicate, so far as this examination goes, the probable nature of the disease.

The *abnormal substances* which may be present in the urine are many, but for practical purposes it is only advisable to treat of proteids, blood, bile, sugar, acetone, organised deposits, epithelial mucus, and pus cells, casts of the renal tubules, and certain crystalline matters, as leucin, tyrosin, cholesterin, and cystin.

The proteids most commonly found in urine are serum albumen, serum globulin, peptones and albumoses, the latter proteids (peptones and albumoses) being intermediate products formed during the process of digestion. All the proteid bodies are precipitated by a number of reagents, and the presence of such substances is consequently determined. The exact determination of one or all requires further examination by appropriate tests which will be afterwards mentioned.

Albumen.—We shall commence with the consideration of serum albumen, which is the commonest of the morbid constituents of the urine, and we shall premise our observations by stating that serum albumen and serum globulin are usually associated together.

It is still an open question whether, apart from diseased conditions, albumen is ever detected in a considerable quantity in urine. With regard to this, opposite opinions are held; yet while giving due credence to the negative and affirmative side, we may confidently state that albuminuria may occur as a temporary condition without serious organic kidney change. In such cases the albumen may be due to some transient change in the renal epithelium or to some disturbance in the circulation.

For a long time it was thought sufficient merely to determine the presence of a proteid matter in urine, and the further question was not raised as to whether it occurred in more forms than one. It is now however established, apart from physiological grounds, that in addition to serum albumen and serum globulin the urine may contain peptone and albumose.

It is to be remembered that serum albumen in notable quantity is never found in healthy urine. Its appearance in all cases is a morbid symptom of great importance. The albumen of urine may be derived from the kidneys, in which case it is termed renal albuminuria, or by admixture from parts in the urinary passages beyond the kidney, when it is designated accidental albuminuria.

(*a*) *Renal Albuminuria.*—This form of albuminuria is dependent, in the great majority of cases, on inflammatory and degenerative changes in the structure of the kidneys. But we cannot infer from the quantity of albumen present the extent and severity of these changes. Great and grave changes in the kidney (as in the granular kidney) have occurred, yet the urine may only contain traces of albumen. Again, without structural disease of the kidneys, albumen may be detected from disturbances of the circulation, provided such disturbances extend to the vessels of the kidney. In fever, cloudy swelling of the renal epithelium is sufficient to cause the appearance of albumen in the urine, and so also may an altered condition of the blood in anæmic and enfeebled individuals, independently of kidney disease.

It must therefore be borne in mind that the presence of albumen in the urine does not necessarily indicate serious kidney change.

(*b*) *Accidental Albuminuria.*—The albumen detected in the urine from a source other than the kidney may come from the renal pelvis, the ureters, the bladder, the urethra, or the vagina. We are warranted in such cases in considering the albumen to be accidental if we fail to detect under the microscope renal casts and round epithelial cells, and if other signs of renal dropsy are wanting.

Determination of Albumen.—There are many tests for this purpose, all no doubt valuable, but we shall select those which we consider to be the most reliable and the most easily applicable. We must premise by stating that on testing for albumen or other proteids the urine should be filtered if turbid. If very highly acid it should be rendered less so by liquor potassæ. If alkaline it should be made slightly acid by means of acetic acid.

1. *Nitric Acid and Heat Test.*—A portion of urine is placed in a test-tube and the upper part boiled. Should a precipitate form on boiling, this may consist either of phosphates or albumen. A drop or two of nitric acid settles this question, for if the precipitate dissolves on this addition it is composed of phosphates, if not dissolved in presence of the acid, but increased thereby, it is albumen.

2. *Nitric Acid alone in the Cold.*—Thirty drops of strong

nitric acid are placed in a test-tube, and the urine is slowly floated over this, or the urine may be placed in the tube and the acid gently poured down the side so as to lie below it. A cloud of coagulation immediately above the junction shows that albumen is present.

The latter is called the contact method, and on it is based the action of other reagents employed for detecting albumen, which we shall now mention.

3. *The Brine Test* (*Roberts's*).—The reagent is made by adding 60 minims of strong hydrochloric acid to a pint of water and saturating the solution with common salt. It is employed in the same way as the nitric acid in the contact method, *i.e.* by slowly pouring the solution down the side of the tube containing about a drachm of the urine, until it underlies it. A cloud of coagulation above the junction indicates the presence of some proteid.

4. *The Potassium Ferrocyanide Test* (*Pavy's*).—This test is conducted by acidulating the urine with acetic acid and adding a 1 to 12 solution of ferrocyanide of potassium; albumen causes a white precipitate.

5. *The Picric Acid Test* (*Johnson's*).—A saturated solution of picric acid, which has a low sp. gr., is floated upon the surface of the urine, and the tube is gently shaken in order to cause a slight mixture of the reagent with the urine. If no cloudiness results, the urine is free from albumen; but if it should, then either albumen, peptones, or alkaloids may be present. Next, heat the mixture to the boiling-point, when, if any turbidity results, it is due to albumen; but if the fluid becomes clear, albumen is absent.

6. *Biuret Test.*—The urine is treated with caustic potash, and a dilute solution of sulphate of copper is added, drop by drop, with a pipette. If albumen be present the resulting peroxide of copper (a green precipitate) is dissolved, and the fluid assumes a reddish violet colour.

This test serves for albumen, albumose, globulin, and peptone. The latter substance, however, strikes *red,* not *violet* in the fluid.

In considering the tests mentioned preference must be given to the heat and nitric acid tests. They are familiar to every one who has had hospital experience. A few errors connected with their use will be subsequently mentioned, but undoubtedly, if these be borne in mind, the two tests in question will discover any appreciable quantity of albumen, and form the basis for a safe and accurate diagnosis of diseased conditions. Unlike the other tests they are not delicate enough to cause confusion between mucus and albumen, and thus lead to needless anxiety.

Next to these tests is picric acid. It is a delicate test, but its very delicacy may cause misapprehension, for its use detects what may be termed physiological albuminuria occurring occasionally in health from errors of diet or exercise. This physiological albuminuria may not be detected by nitric acid and heat, and it is a phenomenon which need give rise to no alarm on the part of the physician or the patient. At the same time, the delicacy of the picric acid test makes its employment advantageous in testing the urine of a patient recovering from scarlet fever, where the earliest appearance of albumen in the urine should be carefully watched, and, if detected, checked by appropriate means. Here the picric acid test should not be relied upon alone, but should be confirmed or discredited by the test of nitric acid and heat.

Errors in detecting Albumen.—We will notice under this head certain errors which may occur in testing for albumen: (1) by heat; (2) by nitric acid; (3) by picric acid.

1. If heat be alone relied upon, it may mislead in two opposite directions. First, by not detecting albumen if the urine be alkaline; hence the necessity of testing the reaction by litmus-paper. If the urine be alkaline, acidify with a drop or two of acetic or nitric acid. Secondly, by giving a delusive cloudiness in non-albuminous urine; a drop or two of nitric acid would increase the clouding from albumen, while on the other hand it clears it away if it depends upon phosphates.

2. A single drop of nitric acid will, in highly albuminous urine, form a white clot or coagulum. This is redissolved by shaking the tube.

3. Urine loaded with urates presents a turbid appearance on cooling. A drop or two of nitric acid in such cases does not clear away the urates, and albumen may be falsely

diagnosed as being present. This error is guarded against by first applying heat when the urates disappear, and an albuminous precipitate is formed, which the subsequent addition of nitric acid fails to dissolve.

4. It sometimes happens when nitric acid is added to clear yet highly acid urine recently passed that it causes turbidity from the deposition of urates. This, however, disappears on heating, while heat has no effect on the albuminous precipitate, unless boiling be prolonged.

5. The cloudiness of the zone obtained when the picric acid solution is added to urine indicates the presence of one of the four proteids. It is to be remembered, however, that picric acid added to the urine of a person who has been taking quinine or other alkaloid will also produce a coagulation which may not be due to albumen.

Quantitative Estimation of Albumen.—The quantitative estimation of albumen is not yet placed on a very distinct or easily applied basis. It may, however, be approximately determined thus: bring a measured quantity of albuminous urine to a slightly acid condition, boil, place the precipitate on a weighed filter, wash, dry at 212° F., weigh; or for practical clinical purposes boil a certain quantity of urine in a test-tube previously acidulated with a drop or two of *acetic acid.* The albumen coagulates, forms flakes, and sinks to the bottom of the tube. The proportion of the albuminous deposit to the amount of urine left uncoagulated in the test-tube is represented in numbers, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{12}$, and so on.

If the amount of albumen be too small to cause any appreciable deposit, this condition is noted by simply stating that after the application of tests for its detection the urine was "cloudy" or "opalescent."

Esbach's process determines with considerable accuracy the amount of albumen. The reagent employed is obtained by dissolving 10 grammes of picric acid and 20 grammes of citric acid in 800 or 900 c.c. of hot water, and, after solution, adding enough water to make 1000 c.c. or 1 litre when cold. It is employed in a special tube holding about 20 c.c.

Method of Using.—Fill the tube with urine as far as the letter "U" and add the reagent until the fluid reaches the letter "R." Close the tube by means of the stopper, gently turn it upside down twice without shaking, and lay it aside for twenty-four hours; at the end of that period read off the height of the coagulation, as shown by the figures at the lower end of the tube. The figure represents the number of grammes of serum albumen and serum globulin in a litre of urine.

Attend to two points. 1st. The urine must be quite acid. If alkaline or neutral, acetic acid must be added until it turns litmus-paper red. 2nd. In the case of highly albuminous urines it is well to dilute them so as to double or quadruple their bulk, taking care when recording the number of grammes in a litre to correct the result. If the amount is above ·6 per cent or below ·05 per cent, the result is not accurate.

Peptones.—If by the Biuret test we find that a *red*, not a violet colour is produced, we may proceed to test for peptones in the manner described in the appendix. So far as our present knowledge goes, the presence of peptones or the condition termed *peptonuria*, and the causes which produce it, are quite different from those to which the other forms of albuminuria are due. It is not associated with nephritis, circulatory disturbances, or anæmia. The presence of peptone in the urine is most commonly connected with such processes as are characterised by the collection and subsequent destruction of leucocytes, under such circumstances that the products of disintegration (including the peptone constituent) can obtain admission into the blood-stream, to be subsequently eliminated by the urine. To the condition arising in this way the term "Pyogenic peptonuria" has been applied by Hoffmeister. It occurs chiefly in the resolution stage of pneumonia, in purulent pleuritic exudations, and in general in suppuration, wherever situated, provided that the conditions are favourable to the absorption of the constituents (peptone) of the pus. Peptone has thus been found in the urine in purulent meningitis, the suppuration of phthisis, after the injection of Koch's lymph, and in all those states which are attended with the formation and breaking down of pus.

It is therefore a valuable diagnostic test, not merely in detecting suppuration as in purulent pleuritic effusions, but also by confirming other evidence of the progress and resolution of pneumonia.

Albumose.—Albumose is a pro-peptone, and according to recent research it is really a mixture of four different proteids. It has been found in the urine in osteomalacia, dermatitis, and intestinal ulcer. The clinical significance of this condition is in general very indefinite, and as it does not lend itself very surely to the aid of diagnosis, its detection does not appear to require special notice.

Globulin probably never, or almost never, occurs alone in the urine, but generally in conjunction with serum albumen. Consequently its import in disease is the same as that of the former body.

Glucose or Grape Sugar.—There are several tests by which glucose or grape sugar can be detected in the urine, but the tests which are really used in hospital and private practice are not very numerous. The principal one is the copper test. This test is based upon the fact that grape sugar or glucose—the form of sugar that is contained in the urine in diabetes—possesses the property of reducing the hydrated oxide of copper to a sub-oxide at a temperature of 212°. The hydrated oxide of copper is *blue*, and liquids containing it in solution have a deep blue colour. On the other hand, the sub-oxide is *orange-yellow*, so that there is no difficulty in seeing whether or not reduction takes place. Now, if the specific gravity of any urine is 1·030 or more, it indicates that glucose is probably present, and this probability is almost a certainty if the urine be pale in colour and excessive in quantity.

Trommer's Test.—The urine is rendered alkaline with liquor potassæ, and a fairly strong solution of sulphate of copper is added, drop by drop, until the oxide of copper formed ceases to be dissolved. The mixture is then heated in a test-tube. If sugar be present in greater quantity than a mere trace, a yellowish or red precipitate of the sub-oxide of copper FALLS BEFORE THE BOILING-POINT is reached, and at the same time the fluid somewhat loses colour.

This test is ordinarily carried out by adding to a drachm of urine placed in a test-tube a drop or two of a dilute copper solution and about half a drachm of liquor potassæ. When heat is applied, unless sugar is present in a large amount, the reaction obtained more closely resembles Moore's than the characteristic copper reduction test.

Fehling's Test.—This is a modification of Trommer's test, but more delicate and accurate. Fehling's solution consists of sulphate of copper, tartrate of potassium, and caustic soda (F. 93). It should be freshly prepared, but if there be any doubt about this, fill a test-tube to the depth of an inch with the solution, boil the latter, and set it aside to cool. If no deposit occurs, the solution may be relied upon. Heat it again to the boiling-point, and add a drop of the suspected urine; if sugar be present, a yellow precipitate is quickly formed, which turns red on longer boiling or standing aside. If the sugar is small in amount, more urine must be added.[1]

Indigo-Carmine Test.—Dr. Oliver of Harrogate has brought this test before the profession. Test-papers are dipped in a solution of indigo-carmine. One of these is placed in distilled water in a test-tube and boiled till a blue solution is formed, when the colourless test-paper may be removed. A drop of the suspected urine is then added, and the liquid is boiled again for a few seconds. Then the tube should be raised an inch or two above the flame and held without shaking, while the solution is kept quite hot, but without boiling, for exactly one minute by the watch. If glucose be present in abnormal amount, the soft, rich blue will first of all be seen to darken into violet; then, according to the quantity of sugar, there will appear in succession purple, red, reddish-yellow, and finally a straw colour. After cooling and exposure to the air, the liquid passes back through the various colours to the original blue. So far as accuracy and delicacy are concerned, the copper tests mentioned fulfil all practical requirements with regard to the detection of sugar in urine. Yet corroborative or negative evidence of the presence or absence of sugar is afforded by :—

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[1] "It is known that many other organic substances besides sugar are capable of reducing the oxide of copper, but none of these are ever present in the urine, with the exception of kreatinin, leucin, uric acid, or chloroform, and of these, uric acid alone could be supposed to be likely to occasion a fallacy in the detection of diabetes. It is certain, however, that urine containing an excess of uric acid does not generally give rise to a change in the copper solution at all resembling that which would be produced by sugar."

(*a*) *Moore's Test.*—This consists in boiling one or two drachms of urine in a test-tube with half its bulk of liquor potassæ. If the boiling be kept up for some time, and if sugar be present, the urine passes through a series of colours which are almost exactly like those of different kinds of sherry, and finally becomes brown or even black. When this process yields a negative result, it may generally be depended upon.

(*b*) *Fermentation Test.*—A small quantity of yeast is placed in a test-tube with a portion of the urine. The tube is inverted on a saucer, also containing some of the urine, and kept in position by a clamp, and placed at the side of a fire or in a warm place having a temperature of 80° F. If sugar is contained in the urine, this is decomposed into alcohol and carbonic acid. In a few hours it will be found that the liquid has receded from the upper part of the tube, in consequence of the accumulation there of the carbonic acid gas.

(*c*) *Picric Acid Test.*—Dr. G. Johnson employs a saturated solution of picric acid with liquor potassæ. When these are boiled with urine containing sugar, an opaque mixture, the colour of porter, results from the development of picramate of potassium. With normal urine the colour is light brown and the fluid transparent.

Quantitative Analysis.—The easiest way to perform this is based upon the fermentation test. It is proceeded with thus : —Collect the total quantity of urine passed in twenty-four hours. Place four ounces of this in an eight-ounce bottle with a small piece of German yeast, and four ounces in a similar bottle without any yeast. Lay the bottles corked aside in a warm place at a temperature of 80° F. for twenty-four hours. Then take the sp. gr. of the fermented and unfermented urine. It will be found that the fermented urine has a lower sp. gr. than the unfermented, and Sir W. Roberts has ascertained after careful experiments that for each grain of sugar per fluid ounce, one degree of density is lost by the process of fermentation. Thus—

Fermented specimen = 1·010

Unfermented specimen = 1·040

Loss—30, *i.e.* 30 grains of sugar per ounce.

This quantity, 30 grains, multiplied by the number of ounces of urine passed in twenty-four hours, will give the amount of sugar excreted by the system in that period. Thus if 100 ounces of urine are passed, 100 × 30 = 3000 grains of sugar excreted.

The performance of this method requires no technical skill, and it gives fairly accurate results. The objection to it is the delay, the result being obtained only after the lapse of twenty-four hours. More accurate and speedy determination of the quantity of sugar present is obtained by Fehling's solution, 10 cubic centimetres of which are reduced by 0·05 of a gramme of sugar.

For this method a graduated burette and stand are required. The process is conducted thus:—Take 10 cubic centimetres of Fehling's solution, diluted with 40 cubic centimetres of distilled water, and boil. Place 5 cubic centimetres of urine diluted 10 times with water in the burette, and from this drop half a centimetre into the hot Fehling's solution. A yellow or red precipitate will fall at once to the bottom. After it has subsided add another half centimetre, and so on until all the blue colour has disappeared. It is essential to note the exact moment of its disappearance. If 20 cubic centimetres of diluted urine be required to decolorise all the diluted Fehling's solution, which, as above mentioned, is equivalent to 0·05 gramme of glucose, the 20 cubic centimetres contain exactly this amount. From this it is easy to calculate the percentage as follows:—

20 : 100 : : 0·05 : 0·25

The diluted urine thus contains 0·25 per cent, and the urine will contain 2·5 per cent of glucose.

Acetone.—Normal urine contains traces of acetone, but this body occurs in excessive proportion under certain morbid conditions, viz. febrile, diabetic, or in cerebral irritation or depression. The most common of these three forms is febrile acetonuria. It does not belong especially to any particular fever. In diabetes it indicates an advanced stage of the disease, and in the mental states mentioned it is found in connection with grave symptoms. Recent researches, moreover, show that an abundance of nitrogenous food tends to the production of acetonuria.

Detection of Acetone.—A quantity of the urine is treated with a few drops of a freshly-made concentrated solution of sodium nitro-prusside, and with a moderately strong solution of caustic soda or potash. This fluid develops a red colour which rapidly disappears, and, if acetone be present, gives place to purple or violet-red on the addition of a little acetic acid. The non-formation of this colour on the addition of acetic acid shows the absence of acetone.

Blood in the urine to the amount of one part in two thousand gives it a smoky tint, and one in five hundred produces a bright cherry colour. All urine containing blood is more or less albuminous, and gives characteristic reactions with the tests for albumen. Corpuscles can be detected microscopically.

Chemical Examination.—The most satisfactory chemical test is the tincture of guaiacum, which must be freshly prepared with rectified spirit. A small quantity of urine is placed in a test-tube, and to this is added a drop of the tincture and as much ozonic ether as will equal the quantity of urine present, then gently shake the mixture. If blood be present, a bright blue colour is seen in the ozonic ether when it separates, or it appears at the junction of the fluids.

Heller's Test.—The urine is treated with a solution of caustic potash and boiled. The (basic) earthy phosphates are thus precipitated, and together with them the hæmatin derived from the oxyhæmoglobin present. The phosphatic sediment is consequently coloured a bright red.

The existence of hæmoglobinuria may be inferred when it is made evident by Heller's test that the urine contains blood-colouring matter, while at the same time the microscope discloses smaller or larger masses of brown pigment, and either no red corpuscles or so few as are inadequate to account for the results obtained.

Test for Bile Acids in the Urine.—Pettenkofer's test, modified by Francis and described by Ralfe, is the best for this purpose. Sulpho-saccharic acid is the agent used. It is made by drying 30 grains of glucose over a water-bath, and dropping it when cold into half an ounce of strong sulphuric acid. If the glucose be quite dry it does not become charred, but a straw-coloured liquid results, which keeps for some days if closely stoppered and placed in the dark. A test-tube is filled to the height of half an inch with this reagent, and the urine is floated upon the surface; a beautiful purple colour at the line of junction is characteristic of bile acids.

Test for Bile Pigments in the Urine (Gmelin's Test).—A few drops of urine are placed on a white porcelain plate, and near to this a few drops of strong nitric acid. The two fluids are to be gently brought into contact, when a play of colours is observed if the bile pigments be present, viz. green, blue, violet-red, and lastly, yellowish-brown.

Certain crystalline substances require to be noticed amongst the abnormal constituents of the urine.

Leucin and tyrosin, when present in the urine, always occur together. Their presence is characteristic of destruction of the hepatic cells, and they are most commonly found in acute yellow atrophy of the liver, as well as in various hepatic disorders, phosphorus poisoning, and some malignant forms of fever.

Cystin is an uncommon urinary deposit. It occurs in some affections of the liver, and has been found in anæmic and tubercular conditions.

Cholesterin occurs in the form of rhombic plates, often with notches at their angles. It is usually regarded as the result of the absorption of purulent matter.

Substances derived from the Genito-Urinary Tract.—Epithelial cells and mucus are normally present in the urine, but pus is an abnormal constituent. It is better to consider the normal and abnormal constituents under this head together.

Mucus.—Mucus in varying quantity is present in all urines, and the light transparent cloud of mucus consists of mucous corpuscles and nucleated epithelial cells. Mucus is not precipitated by heat, but with acetic acid it produces a stringy deposit, and picric acid coagulates it.

Microscopical Examination of the Urine.—When first passed healthy urine is generally quite clear, but on standing it usually deposits a filmy cloud. Microscopically this deposit is seen to consist of a few crystals of various kinds, some white blood corpuscles, and epithelial debris. The examination of morbid urine by the microscope affords important information in diagnosis. It may be thus proceeded with: The urine is allowed to settle, the clear supernatant fluid poured off, and some of the sediment placed in a conical vessel, where it is again allowed for a while to settle; a little of it is then removed with a pipette and placed on a slide for examination. If the sediment should be scanty and require, say, twenty-four hours to deposit, it should be set apart in a cool place, so as to check any fermentative processes which might alter the character of the specimen. Still further to check the fermentation, 20 to 30 c.c. of a fluid containing 5 to 7·5 c.c. of chloroform in a litre of water should be added to it.

Epithelial Cells are of various kinds, the most important being the squamous, columnar, and round forms.

Squamous Epithelial Cells are derived from the bladder or vagina. They are large in size, irregularly circular in outline, presenting distinct nuclei.

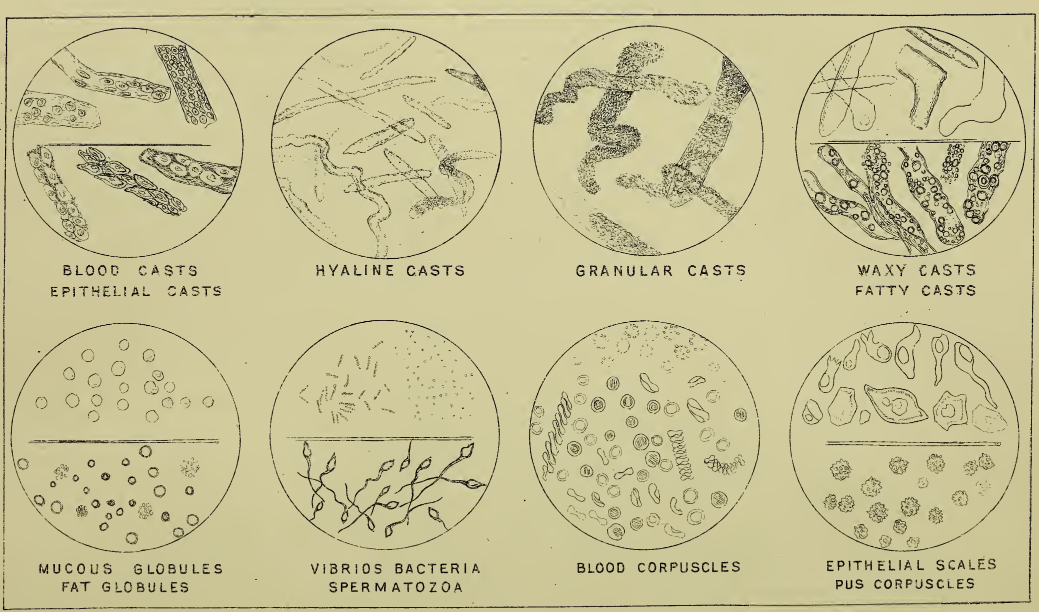
Columnar Epithelial Cells have their origin in the urethra, ureter, or pelvis of the kidney. They present cylindrical or pyramidal outlines, and their form gives an indication of their origin.

Round Epithelial Cells, with distinct nuclei, are of renal origin, and are the result of some change in the renal tubules.

Pus in acid or neutral urines presents an opaque white deposit, but in alkaline urines it occurs as a gelatinous ropy precipitate. Treated with water alone a nucleus may appear, but this is rendered more apparent by the addition of acetic acid. The nucleus then comes out cleft into two, three, or four segments, and if an excess of acid be added, the cell wall disappears and the nuclei float free in the fluid. Liquor

Pl.IX.

RENAL TUBE CASTS. _PUS AND BLOOD CORPUSCLES.



BLOOD CASTS
EPITHELIAL CASTS

HYALINE CASTS

GRANULAR CASTS

WAXY CASTS
FATTY CASTS

MUCOUS GLOBULES
FAT GLOBULES

VIBRIOS BACTERIA
SPERMATOZOA

BLOOD CORPUSCLES

EPITHELIAL SCALES
PUS CORPUSCLES

potassæ forms with pus a viscid ropy substance like white of egg; this is known as the "Vienna test."

Tube-casts are almost always the result of renal inflammation, and are supposed to be produced by a fibrinous exudation into the tubules, forming moulds or casts (Ralfe). If these are washed away without the separation of epithelial cells, *hyaline* casts are formed; if blood corpuscles are mingled with them, *blood casts* are formed; if epithelial cells adhere to them, *epithelial casts* are seen; if the epithelial cells have undergone degeneration, *granular* and *fatty* casts make their appearance. Sometimes the hyaline casts undergo amyloid degeneration, and they are then termed *waxy* casts. They then give a deep stain with iodine. Tube-casts are, as a rule, trustworthy evidence of renal inflammation, recent or old. If recent, as in acute Bright's disease, the casts seen are *hyaline*, *blood*, and *epithelial;* if old, as in chronic Bright's disease, the casts are *granular*, *fatty*, and *waxy*.

Characters of the Urine in Disease.—We will now briefly give a summary of these on salient points.

I. *The Urine in Febrile States.*—In fever the urine is diminished in quantity, deeply coloured, and of high sp. gr. On standing it often deposits an abundant sediment of urates. Microscopically it exhibits a profusion of crystals of uric acid and urates, and occasionally a few hyaline casts with scattered leucocytes and renal epithelium. It commonly contains a small quantity of albumen, and in recovery from scarlet fever a daily examination as to the presence or absence of albumen should be made and the result noted. In pneumonia the presence or absence of chlorides will be noted. If the case is in the stage of consolidation they are diminished or absent from the urine, but they are again detected when resolution begins.

II. *The Urine in Congestive Disorders of the Circulation.*—The characters here are similar to those observed in fever, with the exception that the deposit of urates is not marked, and albumen, if present, is in greater quantity. Microscopically, especially when the congestion is chronic, the urine exhibits some leucocytes and altered blood corpuscles, often also hyaline casts, a few granular casts, and renal epithelium.

III. *The Urine in Disease of the Urinary Organs.*—1. Renal affections. (*a*) *Acute Nephritis.* Here at first the urine is diminished in quantity, of acid reaction, and high sp. gr. 1·020-1·025. Its colour ranges from blood-red to that of a watery extract of meat, and the presence of blood pigment can be detected by Heller's test. Albumen is abundant. The sediment under the microscope at the outset of the disease, as in nephritis after scarlatina, shows—1. Red blood corpuscles, presenting the appearance of washed-out discs and irregularly-shaped bodies. 2. Some leucocytes. 3. Epithelium. Chiefly small uninuclear cells from the urinary tubules, with a few others derived from the renal pelvis and bladder. 4. (*a*) Blood casts containing red corpuscles. (*b*) Casts formed mainly of leucocytes. (*c*) Epithelial casts. (*d*) Hyaline.[1] (*e*) After the lapse of a few days, and side by side with those described, appear the metamorphosed casts, granular, waxy. If death from uræmia or œdema of the lungs does not ensue, the urine becomes more abundant and the colour paler. The albumen is less marked, and finally ceases with the approach of death.

(*b*) *Chronic Nephritis.*—The urine is normal in quantity, or somewhat lessened, acid, and of normal sp. gr. It usually contains a considerable proportion of albumen. Microscopically the sediment is variable in character, but renal epithelium is never absent, and the casts are often fatty. Granular and hyaline casts are observed covered with blood corpuscles or renal epithelium.

The occurrence of casts composed of fatty matter or overlaid with fat crystals indicates advanced fatty degeneration of the kidneys.

(*c*) *Contracted Granular Kidney.*—The quantity of urine in the twenty-four hours is greatly increased. Its reaction is acid, and the sp. gr. low, 1·008-1·012. The colour is pale, and there is little albumen—sometimes only a trace. The sediment as a rule is scanty, and under the microscope exhibits merely a few hyaline and granular casts.

(*d*) *Amyloid Kidney.*—The characters of the urine are for the most part similar to those mentioned under the granular kidney. The quantity is increased (though sometimes normal), the reaction acid, and the sp. gr. low. As a rule, however, it contains more albumen. Microscopical examination of the sediment shows, as a rule, though subject in this respect to much variety, hyaline casts in comparative abundance, and some epithelium.

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[1] The hyaline casts are more or less beset with epithelial cells and blood corpuscles.

(*e*) *Uræmia.*—The urine in cases where symptoms of uræmia supervene is always loaded with albumen, and microscopically resembles that of nephritis. In quantity it is very scanty, the sp. gr. is below the normal standard; sometimes there is total suppression. When the quantity excreted remains unaltered it is always observed that the sp. gr. is greatly reduced.

IV. *The Urine in Hepatic Affections.*—In all diseases which seriously involve the proper structure of the liver, the excretion of urea is diminished, and in acute yellow atrophy it is entirely suppressed. It is then to some extent represented by other nitrogenous substances, as leucin and tyrosin, and together with these certain non-nitrogenous substances.

Albuminuria may occur without any coarse kidney lesion. This physiological albuminuria is especially common in young people. It may occur after muscular exertion or excessive ingestion of proteids. Osler holds that in every case we have a temporary alteration in the renal epithelium. Other observers look upon the condition as purely physiological.

I. *Dietetic.*—Albuminous substances in food are in health transformed by the digestive process to such an extent that no albumen is found in the urine. Occasionally this transformation is not complete, albumen is detected in the urine, and this incomplete transformation is often associated with the taking of such substances as eggs, cheese, new bread, or pastry. Sometimes the albuminuria cannot be attributed to any particular kind of food, but seems to be caused by all nutriments, and for this condition no satisfactory explanation, chemical or physiological, can be given.

II. *Muscular Exertion.*—In such cases the urine voided after breakfast and after some exercise has been taken contains albumen, but at other periods of the day, if rest is maintained, it is absent. If, however, active exercise, as walking quickly or riding sharply, is indulged in, then albumen will again appear, with, as a rule, an abundant deposit of oxalates.

III. *Paroxysmal Albuminuria.*—This condition is very similar to that of hæmatinuria, for the attack commences with a rigor and pain in the small of the back. The urine passed is dark in colour, and remains so during two or three micturitions.

IV. *Simple Persistent Albuminuria.*—In such cases, which are rare, the urine passed always contains albumen, but with no tube-casts.

Treatment.—In the dietetic and paroxysmal form, chloride of ammonium, with regulation of diet, is the best remedy. In the muscular form, active exercise should be forbidden, but exercise with dumb-bells in a sitting position does not do harm. Massage is also said to be beneficial. In the paroxysmal form possibly ergot is the medicine from which most benefit may be derived. The health in the forms mentioned is generally below par, but albumen may be found in the urine of persons who, so far as can be ascertained, are in good health. This condition is termed by German writers "Physiological Albuminuria," and they state that it depends upon a congenital deficiency in the power of the glomerular epithelium to resist the passage through it of albumen. This physiological albuminuria is sometimes detected by medical officers acting for insurance companies, and the question occurs, Should such lives be accepted? The reply is, Yes, with a slight extra premium, if there is no history of a former attack of nephritis, and if no tube-casts are found in the urine.

CONGESTION OF KIDNEY.—Active congestion of the kidney is considered under Acute Nephritis, but it seems advisable here to refer to congestion of the kidney, which is not active but passive. Experimental researches show that impediment or obstruction to the return of blood from the kidneys induces passive congestion of these organs, and if sufficiently intense and prolonged, causes albumen to appear in the urine. We have in some diseases the same impediment or obstruction. This may be thoracic, as in valvular heart-disease, emphysema, pleuritic effusion; or abdominal, from tumours, a gravid uterus, or a cirrhotic liver.

It is difficult to separate such cases of albuminuria from those of chronic Bright's disease by any pathological standard, yet their clinical features are distinct. For chronic Bright's diseases, to be afterwards considered, are diseases *per se*, affecting chiefly the kidneys; while passive congestion seems to be only an adjunct to other diseased states of the system, or symptomatic of certain natural conditions, as pregnancy. The leading clinical distinctions of passive renal congestion are as follows: it makes no independent progress; it varies with the obstructive process (the rising or falling of the venous obstruction); it does not cause a fatal termination; it remains as it were subsidiary and only symptomatic.

Treatment.—In passive congestion the remedies against the original cause of the congestion should be put in force. Passive congestion from lung and heart diseases can be relieved only by remedies acting on the original complaints. Thus absorbents or paracentesis for chronic pleurisy, digitalis to assist the labouring heart in valvular disease, and the remedies employed in these affections should be aided by appropriate diet.

The special treatment for albuminuria with pregnancy is considered at p. 384, under Uræmia.

BRIGHT'S DISEASE

The kidney has a thin, translucent, lightly-adhering capsule, and beneath this capsule is the kidney proper, containing a complicated and convoluted series of tubes lined with epithelium; and lying between the tubes, supporting and binding them, is a thin delicate web of fibrous tissue, and an abundant supply of blood-vessels to enable it to perform its secreting function. Each and all of these various parts may be affected with disease, but, as can be conceived from the intimate union existing between them, one cannot be affected without the other sympathising, whatever may be the original starting-point. Diseases implicating the tubes, fibrous tissue, and blood-vessels thus merge into one another.

The name "Bright's disease" is deservedly given in honour of the illustrious physician of Guy's Hospital, who, in 1827, threw the ægis of his name round all kidney affections associated with albumen in the urine.

ACUTE BRIGHT'S DISEASE

Acute Nephritis.—*Synonyms*, Acute Albuminuria, Acute Desquamative, Parenchymatous, Tubular Nephritis.

The kidney is always enlarged, sometimes to twice its natural size, its capsule easily stripped off, its colour in the earlier stage deep red, and the section dripping with blood; in the later stage, it is mottled red and white. The microscope shows cloudy swelling, fatty degeneration, and increased desquamation of the tubular epithelium, leading to partial blocking of the tubules. The intertubular stroma usually shows a moderate infiltration with leucocytes, but is not otherwise altered. The Malpighian corpuscles are usually swollen, and blood may be effused into their interior.

A special variety of the disease is called GLOMERULO-NEPHRITIS. This is specially seen after scarlet fever, and with it the Malpighian bodies are principally affected.

Acute Nephritis usually terminates in recovery, but it may become chronic, giving rise to the LARGE WHITE KIDNEY. Occasionally this form of kidney contracts and the WHITE GRANULAR KIDNEY results.

Causes and Symptoms.—It may be the direct result of cold or intemperance, or occur during convalescence from scarlet fever or other blood-poison. Fever, pain in the loins, and marked diminution of urine characterise the early stages of this affection. The urine is also albuminous, smoky-coloured, or dark brown from the admixture of blood, and contains epithelial and blood casts. The specific gravity is high from decrease of water and increase of solid constituents. Dropsy supervenes. If a favourable termination ensues, the urine becomes more abundant, the skin moist, blood, albumen, and tube-casts disappear, and convalescence and recovery are established in a varying interval of weeks or months. A large proportion—Frerichs says two-thirds—recover.

Treatment.—In the case of acute nephritis it is necessary to order the patient to remain in bed, if we wish to render the prospect of a speedy and favourable issue more certain. By insisting on this we keep up a uniform and constant warmth of the skin, and avoid any danger attached to cooling of the cutaneous surface and thereby inducing additional fluxion to the kidneys. We try to diminish the inflammatory process by remedies, which produce diaphoresis and otherwise relieve the strain on the overloaded tubes of the kidneys. To accomplish these objects the bowels should be freely moved by jalap or elaterium (F. 27). The nitrate of pilocarpine should be given subcutaneously in $\frac{1}{6}$-$\frac{1}{3}$ grain doses. Its sudorific action is rapidly produced, and it not only removes water from the body, but by taking away urea and other products of tissue waste, it notably tends to diminish the risk of uræmic convulsions. Perspiration may also be induced by packing in wet cloths; by a hot-air bath, the patient, covered with blankets, being seated on a cane-bottomed chair, under which are placed two or three lighted spirit lamps; or by a hot bath with a temperature at first of 100° F. gradually raised to 107° F., in which the patient rests so long as he feels comfortable. After half an hour, or an hour at longest, in his bath, the patient should be carefully rubbed down, and placed in a warm bed, with an extra supply of blankets. To aid diaphoresis hot water should be sipped, and a mixture of acetate and citrate of potassium in an infusion of digitalis should be ordered. Locally dry-cup the loins and apply linseed-meal poultices.

Dietetics.—The drain upon the system occasioned by the loss of albumen and blood brings on loss of strength and flesh, and therefore the diet should be one that can be easily assimilated, while at the same time it improves the general nutrition. The ideal fare for these objects consists in milk and buttermilk, soups with rice and barley, lemonade. The use of tea and coffee should be forbidden, as they exercise an irritating action on the kidneys.

Other lines of treatment have been recommended less active than "hard purging and sweating."

1. The skin being kept just moist. 2. A daily evacuation

from the bowels. 3. Mild diuretics, as citrate or bitartrate of potassium, with a free supply of water. 4. Only milk and arrowroot. We have no means of checking albuminuria. Fuchsin, nitro-glycerin, and astringents have proved ineffectual.

CHRONIC BRIGHT'S DISEASE

Synonym, Chronic Albuminuria.—Three chief types are recognised as post-mortem appearances of those dying of chronic Bright's disease.

A.—CHRONIC NEPHRITIS.—*Synonyms*, Chronic Parenchymatous, Tubular or Diffuse Nephritis, Large White Kidney.

The structural changes in the LARGE WHITE KIDNEY are similar to those described in the acute form of active congestion of the kidney, but advanced to a further stage. The kidney is enlarged and the capsule is easily stripped off. Patches of blood-vessels are seen on the white marbly surface. On section the cortical substance is observed to be greatly increased; its colour being ivory white, or, if fatty transformation has ensued, yellowish. The cones retain their usual hue, but they appear abnormally red, from the contrast they present to the white cortex.

The microscopic changes are principally observed in the uriniferous tubules, but the interstitial tissue is also increased. The epithelial cells are swollen, increased in number, and often loaded with fatty particles. Moulds of the uriniferous tubules, composed of confluent epithelial products, are present: usually also blood is seen within the tubules. The Malpighian corpuscles are not strikingly enlarged, their capsules are usually thickened and a few have undergone atrophy. The intima of the arteries is thickened from atheroma.

The large smooth kidney generally remains smooth and enlarged until death occurs. Should the patient survive long enough, the enlargement gives place to shrinking, which is progressive, so that in some instances the weight of the kidney may be reduced to one ounce.

When this atrophic change is reached the capsule is thickened, and adheres to the surface of the organ, and a slight granular condition is observed. There is a relative increase also of the fibrous stroma, with a destructive and gradual absorption of the distended tubules and their epithelial contents.

When the large white kidney is infiltrated with fat, it constitutes one form of the fatty kidney—oily particles being found in great numbers in the substance of the epithelium and lying free in the tubules. Such a fatty change results more often from cold than from scarlatina.

B.—Granular Kidney.—*Synonyms*, Chronic Interstitial Nephritis, Contracting Granular Kidney, Gouty Kidney, Cirrhosis of Kidney, Fibrosis of Kidney.

In this form the kidney is diminished in size, reduced in weight, and the colour is brown or brownish-red. The surface is rough with numerous rounded elevations, which vary in size from a pin's head to a hemp seed, or even a small pea. These rounded eminences give rise to the granular appearance. In contradistinction to what is observed in the "large smooth kidney," the capsule is adherent to the surface of the organ, so that in peeling it off the granular surface is injured. On section, the cortex is visibly atrophied, as compared with the cones, and forms a thin rim of only a line or less in thickness round the bases of the pyramids. Its colour is red or brownish-red, and the texture is coarse and granular.

The entire organ is in fact tough and resistant, and its weight is reduced to two or three ounces or less. In that form of granular kidney produced by gout there may be seen, in the pyramidal portion, longitudinal white or yellowish streaks caused by a deposit of urate of sodium. When a section of granular kidney is placed under the microscope it will be observed that there is manifest destruction of the secreting tissue. This wasting is irregular in character; the cortex presents wedge-shaped areas of fibro-cellular tissue, alternating with dilated tubules, whose epithelial lining has become transformed into a more or less flat-celled epithelium. The great majority of the Malpighian bodies are destroyed, being represented by homogeneous masses, and are unnaturally crowded together. A few, however, remain active, and these are not infrequently enlarged. The uriniferous tubes are altered. Some are stripped of epithelium and reduced to tubular threads; others, equally denuded, contain glassy cylinders; while others again are full of broken-up epithelium. Oil is sometimes found in the fibrinous exudation and disintegrated epithelium, but not so often or so abundantly as in the large smooth kidney. The arteries show thickening of all their coats—the increase being specially marked in the muscular coat.

Dr. Bright's original description of the kidney is terse and complete, and not being clouded with redundant verbiage is easily remembered: "The kidney is rough and hard, and gives resistance to the knife in attempting to cut into it. Numerous projections are seen on the surface, not much exceeding a pin's head. The tubular portion appears to be drawn near to the surface. IT APPEARS TO BE, IN SHORT, LIKE A CONTRACTION OF EVERY PART OF THE ORGAN, WITH LESS INTERSTITIAL DEPOSIT THAN IN THE LAST VARIETY."

C.—LARDACEOUS KIDNEY or WAXY KIDNEY.—*Synonym*, Amyloid Kidney.

Externally the waxy kidney is smooth, and the capsule peels off easily. The organ is as a rule enlarged; occasionally it is diminished in size. On section, it is firm, the cortex is observed to be bloodless, of a white or yellowish colour, with a waxy smooth appearance like bacon-rind or white beeswax. On the smooth cut surface the natural appearance is altered, for it is dotted over with bright glancing points, which are the altered Malpighian bodies. The cones are unnaturally red and distinct. Under the microscope with a thin section, the waxy change is seen to affect first the Malpighian corpuscles, and when no reagent has been added they appear as shining particles with thickened capsules, the vascular tufts being greatly distended and having the characteristic reaction to be afterwards mentioned. In advanced cases the vasa afferentia, with the arteries and the capillary network of the cortex, and even the vessels of the pyramids, are similarly affected. Later on the epithelial cells of the uriniferous tubes are commonly shrunken and sometimes infiltrated with fatty molecules. Only rarely are they the seat of the waxy change, but the basement membrane of the tubes is frequently affected. Hyaline or waxy casts appear in some of the tubules.

It is to be noted that the liver and spleen are also usually enlarged and in a waxy condition when the kidneys are so affected.

Virchow considered that the violet colour produced by iodine and sulphuric acid when applied to a section of the waxy kidney, showed that it belonged to the same group as starch and cellulose, which give the same tint with these reagents. Later analyses show that the waxy kidney contains nitrogen, as much as 15 per cent, in almost the same proportion as the protein compounds. No sugar could be produced by boiling it with dilute sulphuric acid; but it yielded a violet colour with the cupro-potassic solution, dissolving completely in dilute caustic potash, and being precipitated from this solution in a white flock by acids. It thus resembled albuminous compounds, the exact proportion of carbon, hydrogen, and nitrogen being, according to Kekulé, in a selected specimen of lardaceous kidney, C. 53·58; H. 7·00; N. 15·4—nearly the same percentage as occurs in albumen. Virchow's term, "amyloid," is thus by late investigations proved to be a misnomer, and it sometimes leads to hazy ideas as to the connection between waxy degeneration and the (genuine) amyloid substance found in the healthy liver.

The student, after having read the description of the pathological changes in acute and chronic Bright's disease, should tabulate these changes—for this is a good aid to individual memories—under 1, colour; 2, size; 3, appearances to the naked eye on section; 4, microscopic changes of different structures of the organ.

THE LARGE WHITE KIDNEY,

following on the acute form or having a latent undetected origin, is attended with dropsy, the countenance being puffy and pasty. The urine is scanty, containing CASTS—EPITHELIAL, FATTY, or HYALINE; and the specific gravity normal or rather high, with albumen always present.

The average age of the patient is twenty-eight years.

Recoveries and relapses are frequent. In fatal cases the ordinary duration of the disease is under six months, and in exceptional cases it may extend over some years.

THE GRANULAR CONTRACTING KIDNEY

is associated with middle age, not youth, being most common about fifty years, and more frequently observed in males than females in the proportion of two to one. Its commencement is insidious, the early symptoms slight, the progress slow, and the disease may run a latent course for months or years. The first evidence of the disease may be frequent and severe headache, or simply hemicrania, or loss of strength, or vertigo, palpitation, and difficult breathing. Any one of these symptoms occurring in a person of middle age is suspicious, and may attract attention to the kidneys. In others frequent micturition and some slight puffiness of the ankles lead to the examination of the urine, which is found to be copious in quantity (three to four pints), of low sp. gr., and with a COMPARATIVELY SMALL QUANTITY OF ALBUMEN. THE TUBE-CASTS ARE FEW, AND, IF PRESENT, ARE CHIEFLY HYALINE OR GRANULAR, with but little epithelium or fat. In later stages the urine becomes scanty and the albumen more abundant. The general health gives way, the pallor becomes pronounced, chest and stomach derangements increase, and death ensues through exhaustion, or with symptoms of œdema of the lungs, uræmia, or other intercurrent affection. As harbingers of speedy decease may be mentioned obstinate vomiting and diarrhœa, with itching of the skin and drowsiness. How the chronic nature of the disease gives rise to increase in the heart's structure is as yet an undetermined question; still, in nearly 50 per cent of the cases there is hypertrophy of the left ventricle, and a high tension pulse. The most consistent explanation of the hypertrophy is given by Traube, who attributes it to increased tension in the arterial system, this tension of necessity taking place as soon as a great number of arterial branches in the kidneys, with the Malpighian tufts attached to them, become obliterated, thus reducing the channels through which the blood of the renal artery can drain away. The hypertrophy of the left ventricle he regards as being for some time a necessary and efficient compensation for the loss of renal secreting tissue, and so long as the hypertrophied heart labours energetically no uræmic symptoms occur, for an over-abundant secretion of urine is being carried on. The albuminuria is in part due to loss of epithelium and in part to high tension in the glomeruli.

Gull and Sutton go further than this, and state that there is fibrous thickening of the coats of the small vessels through the whole arterial system, and thus deny the claim which the kidney has as the special causative factor of the ventricular hypertrophy. They state that this general arterio-capillary fibrosis leads to thickening of their walls, with loss of elasticity and subsequent wasting of the tissues, and so gives rise to the hypertrophy in question. See also p. 248, under Diseases of the Arteries.

Retinitis Albuminurica occurs chiefly in connection with the granular contracting kidney, although it has been observed also in the nephritis incident to pregnancy and following on scarlet fever. Diminution of the sharpness of vision develops itself gradually, and an ophthalmoscopic examination in the early stage shows the papilla of the optic nerve grayish-red and swollen, with its margin indistinct and blurred; the veins of the retina enlarged and tortuous; the arteries constricted. Extravasations of blood are also observed on the retina, and white spots of various forms, from fine points up to large patches. In the course of time the white spots extend, and larger and smaller extravasations stand out. These retinal changes may subside and the white patches become smaller, with the vessels visible and the margin of the disc sharper in its outline. Yet a permanent recovery is only to be hoped for in the acute nephritis of pregnancy and scarlet fever.

THE WAXY KIDNEY

is associated usually with amyloid disease of other organs, as liver or spleen, and with a previous history of syphilis, phthisis, caries, long-continued suppuration, or other exhausting conditions. It is characterised by a large flow of urine, 100 to 200 ounces being passed in a day. THE URINE HAS A LOW SP. GR., WITH FEW TUBE-CASTS, GENERALLY HYALINE IN CHARACTER. The albumen is at first slight, but as the disease advances, the urine, as in the previous form described, becomes of higher sp. gr., and the albumen more abundant. Dropsy does not, until the late stages have been reached, form a prominent feature of the disease. Cardiac hypertrophy and increased arterial tension are not found as a rule. The disease may not be recognised at first, and hence may extend over a series of years. Indeed, it seems to form a part of various constitutional states, and upon these its ultimate issue depends.

TREATMENT OF CHRONIC BRIGHT'S DISEASE

requires careful management, and is based on diet, climate, and medicine.

Diet and Climate, etc.—Flannels should be worn next to the skin, and daily exercise should be permitted. As far as possible a milk diet should be taken, and all strong alcoholic stimulants forbidden. Yet, to obviate anæmia three ounces of claret with soda or lithia water are useful. Fats and carbohydrates aid treatment, but animal food should be eschewed as much as possible, and for those who cannot digest milk readily, reliance should be placed on a vegetable diet which contains least vegetable fibre, as potatoes, rice, and onions. Ripe fruits are also beneficial. The fact that renal disease as a rule is not common in tropical or very cold countries indicates that the humid and variable climate of this country should be exchanged for one which is uniform and dry. Algiers or Cairo during winter can be recommended. A long sea-voyage, as to New Zealand or South America, is of unquestionable utility at any period of the year.

The constant draining away from the blood of one of its most important constituents necessitates the administration of *tonic medicines*, and of these experience has shown that iron in some form is the best. The tincture of the perchloride alone often causes headache, but to some extent this is avoided by combining it with dilute phosphoric acid and syrup of lemon (F. 90*a*). The scale preparations, or the syrup of the phosphate, or the iodide of iron can be recommended. In whatever preparation iron is prescribed, it should be continued with perseverance. In females dialysed iron with glycerin is sometimes serviceable. Other treatment is symptomatic, for we have no medicine which directly or permanently diminishes the quantity of albumen daily lost.

Purgatives are of great value; thus compound jalap powder and bitartrate of potassium may be ordered twice or thrice a week, or morning draughts of the bitter saline waters of Friedrichshall or Hunyadi Janos. If circumstances permit, and no headache attends their being taken, then Turkish or Russian baths are undeniably useful. By careful diet, by removal to a warm climate during winter, by judicious use of purgatives and baths, many cases of chronic Bright's disease may be greatly benefited, and a fairly healthy life enjoyed. If dropsy, notwithstanding palliative measures, sets in, then a hydragogue cathartic, such as pulv. elaterini co., given every third night, is required. Diuretics now should also be ordered, and of these the most potent in my experience is Trousseau's wine—the ingredients to be used, the method of preparation, and doses are indicated under F. 40*a*. Diuretin also acts well; 90 to 120 grains should be given daily, in small doses frequently repeated dissolved in warm water.

Strophanthus or caffeinæ citras has sometimes, for a longer or shorter period, a rapid and surprising action.

The best diaphoretic is a preparation of jaborandi, by the mouth or hypodermically in the form of the nitrate of pilocarpine.

In extreme dropsy punctures or incisions may be made into the skin of the legs or scrotum. Dr. Southey's drainage-tubes can be specially recommended as safe and useful. These consist of a perforated needle, which is inserted into the swollen legs, and to this gutta-percha tubing is attached and placed in a vessel below the bed. The needle should be sterilised and every care taken to prevent erysipelas.

THERE CAN BE NO DOUBT THAT OPIATES SHOULD NOT BE GIVEN. This statement includes preparations of opium, chloral, belladonna, and stramonium. In extreme restlessness the bromides of potassium and ammonium may be administered in large doses. Should excessive drowsiness result from their use, it may add to the danger of the poison of the disease, and should be combated by caffeinæ ammonio-citras gr. v., or iodide of potassium gr. vi., thrice daily. Hoffmann's anodyne (sp. æth. co.) may sometimes be substituted for the bromide of potassium, and a few drops of ether may be inhaled when there is great distress in breathing.

OTHER DISEASES OF THE KIDNEYS

We may say in general terms that the kidney or kidneys may be attacked by CANCER, either primary or secondary, usually of the encephaloid form, and that the leading symptoms of the former are a tumour in the abdomen, sometimes very large, and hæmaturia; that TUBERCLE or HYDATIDS may also originate in the organ, exhibiting in neither case very well-defined symptoms, though resulting fatally in both; that when any impediment exists to the flow of urine from the kidney, DROPSY of the kidney, or HYDRONEPHROSIS, may ensue, through dilatation of the pelvis, with atrophy of the cones or whole substance of the organ; and that, finally, one or both kidneys may be shifted from their original position, occasioning the condition known as MOVABLE KIDNEYS. To enter, however, further into details would be foreign to the object of this handbook.

SUPPRESSION OF URINE.—Professor Grainger Stewart states that suppression of the secretion of urine arises under two conditions—1st, when there is obstruction in the line of outflow; 2nd, when there is some fault in the kidney itself.

1. OBSTRUCTIVE SUPPRESSION.—This is most commonly due to the impaction of a calculus in one ureter when the other kidney has been permanently destroyed; or from the presence of a tumour, as of the bladder and uterus, pressing on both ureters.

Urine in such cases is passed in small quantities, pale, and of low specific gravity. When suppression is complete, the duration of life appears to vary from nine to eleven days, death being preceded for two days by muscular twitchings, contraction of the pupils, drowsiness, and rarely convulsions, with no dropsy or urinous odour of the breath.

2. NON-OBSTRUCTIVE SUPPRESSION.—In the course of acute Bright's disease complete suppression of urine may take place. It may also occur in the cirrhotic or granular form of Bright's disease, or as a consequence of injuries to the urethra, or in the algid state of cholera, or in hysteria.

Treatment.—This consists in giving hot baths and local fomentations, avoiding the administration of all powerful diuretic medicines, which would only aggravate the condition of matters. In cases of obstructive suppression various operations have been successful, and the passing of a sound into the ureter of a female has been favourably reported on.

PYELITIS

Inflammation of the pelvis of the kidney or Pyelitis usually arises from (1) direct irritation of foreign bodies in the pelvis and infundibula of the kidney as calculi and gravel; (2) tubercle; (3) decomposition of the retained urine; (4) inflammation of the bladder spreading along the ureter to the pelvis. Occasionally it may be produced by overdoses of cantharides or turpentine, or it may occur during the course of continued fevers, the exanthemata, diphtheria, and cholera. The mucous membrane is swollen, its vessels injected, and the surface covered with muco-pus. If this condition is persistent, marked suppuration may be established, and if its cause be a calculus there may be ulceration, not merely of the mucous membrane, but also in the substance of the kidney. This may be designated Suppurative Nephritis. If the pus can escape easily by the ureter, and if one kidney only be affected, the mischief may continue for years with little except local uneasiness, and in some cases this also disappears. But, in other cases, and whether or not the ureter is obstructed, an ABSCESS may form, enlarging and pointing in different directions. Sometimes it penetrates the diaphragm; points in the loins; bursts into the peritoneum, or descends along the psoas muscle and is seen under Poupart's ligament.

Symptoms.—Pain and tenderness in the loins, increased by pressure or movement, irritability of the bladder, sickness, fever, and thirst, and the passage of urine containing albumen, characterise the early stage of the affection. Later on the urine contains pus in notable quantities, and if *suppurative nephritis* be established, the local pain is greatly increased, and rigors and hectic fever are manifested. The urine remains acid. In most cases a typhoid condition supervenes, with suppression of the urine and death by exhaustion.

Treatment.—In the early stage it is advisable to leech or cup the loins, and to follow this up by fomentations or a hot bath. The bowels should be freely moved by a hydragogue cathartic; warm fluid liquids should be drunk, and citrate of potassium administered with small doses of opium if there be much pain. If the case be more chronic, astringents are commonly employed, as the mineral acids, perchloride of iron, acetate of lead, and in very chronic cases oil of sandal-wood, copaiba, or benzoic acid are given. If an abscess has formed surgical treatment is obviously necessary.

URÆMIA.—Uræmia is the term applied to a set of symptoms which develop on the accumulation in the blood of the products of tissue metabolism. Bouchard has shown that normal urine contains poisonous nitrogenous bodies. The usual explanation of uræmia is, that, owing to deficient excretion by diseased kidneys, the products of normal metabolism accumulate in the blood. Bradford, however, has recently shown that destruction of large portions of kidney tissue leads to profound changes in the tissue metabolism. Owing, possibly, to the loss of an internal kidney secretion there is a great increase in the production of urea and bodies of the creatin class. Thus uræmia may be due to the accumulation of abnormal tissue products. In support of this view is the fact that the serum of uræmic patients is poisonous, but the poisonous materials differ from those contained in normal urine.

The earliest and most constant of all the symptoms is vomiting, which at first occurs in the morning before food has been taken, but afterwards the vomiting follows on every meal, or sometimes apart from the ingestion of food. It is sometimes so persistent as to lead to death by exhaustion, and when it is thus extreme there may be no twitchings, coma, or convulsions.

Much more frequently, however, the retained poisons affect the nervous centres, as is evidenced by the occurrence of seizures precisely like those of epilepsy. Their onset may be sudden, or preceded for a few hours or days by headache, drowsiness, by vertigo, by transient pains in the limbs, muscular twitchings, or by dyspnœa, paroxysmal in character and resembling an attack of asthma.

During the convulsions there is foaming at the mouth, stertorous breathing, and profound insensibility, and as these symptoms pass away a comatose condition ensues. Before insensibility is over there may be a succession of paroxysms, in which case the attack is very likely to be fatal, yet not always so, for when all hope seems lost, the patient may regain consciousness. A single paroxysm rarely ends fatally.

One of the most remarkable effects of uræmia is blindness, which may follow or precede the paroxysm, and is always complete. It rapidly subsides and the patient regains sight in twenty-four hours, or at the most in the course of a few days. In some cases uræmia shows itself by slighter symptoms, as short attacks of spasm in the facial muscles or in those of the eyelids, the patient meanwhile retaining consciousness or being at the most confused or dull. Sometimes irritating cutaneous eruptions are observed.

These symptoms in the acute or less severe forms of uræmia are always associated with *antecedent renal troubles*, and in this way they are diagnosed from those attendant upon epilepsy, cerebral hæmorrhage, or alcoholic intoxication.

In all forms of Bright's disease uræmia, manifested by one or more of the symptoms, may occur, but, as a rule, they only come on suddenly and with great violence in acute nephritis following on scarlet fever, or in the convulsions associated with pregnancy. Convulsions, coma, and death may then succeed each other in a few hours. In most if not all other conditions these are significant warnings of their existence.

Treatment.—When a uræmic attack has actually begun our resources are but limited, especially in anæmic patients, and consist chiefly of anæsthetics, and for this purpose inhalation of chloroform may be tried, or chloral injections by the rectum. The quantity of chloral in the injection should be 45 grains to an adult, or 15 to a child, and it may be repeated if desirable. Withdrawal of the ascitic fluid and the subcutaneous injection of digitalin proved successful in one case under my care, and doubtless the injection of pilocarpinæ nitras gr. $\frac{1}{4}$ in 3 minims of water must, on physiological grounds, be useful. Should the attack be sudden, and the blood not greatly impoverished, as sometimes happens in pregnant women, free venesection has much to recommend it, and should not be dismissed as absurd simply because it was the panacea of our forefathers. In all the forms of Bright's disease I have, by means of the ureameter,[1] carefully noted the quantity of urea excreted daily, and when this notably diminishes I suspect the probability of a uræmic attack, and endeavour to ward it off by drastic cathartics and copious perspiration. Elaterinum, in combination with colocynth, may be selected as the best drastic cathartic for this purpose (F. 27), and pilocarpine injections may be relied on for producing diaphoresis. Benzoic acid, on the supposition that ammonia is the cause of the convulsions, has likewise been recommended in 7-grain doses every three hours. The poisonous alkali, it is thus fancied, may be converted into a harmless acid and a salt.

A word or two here may be fitly added with regard to puerperal convulsions, which seem to be attendant on the albuminous state of the urine. These may be divided into three great classes—

1. The convulsions which commence before labour begins.

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[1] See Appendix.

2. Those which come on during labour.
3. Those which succeed delivery.

In the first series, several observers state that chloral arrests the convulsions. In the second, the administration of chloral has been attended with excellent results. At the same time labour should be finished as soon as possible by the forceps or otherwise. In the third, one dose of the same drug may terminate the convulsions. How or in what doses are you to give it? 60 grains if you wish strong action, and follow this up by 15 grains if it seems to lose its effect. It should not, however, be pushed beyond 120 grains in the two hours. Some have recommended giving it in a pessary by the vagina. The efficacy of this is doubtful. If the patient cannot swallow, it must be administered by rectal injection.

HÆMATURIA, as its name implies, means the admixture of blood with the urine; and this mixture is easily recognised by the colour it imparts to the secretion, unless the quantity is very small, when it may require the aid of the microscope to detect it. Blood or blood-pigment can be detected by tests mentioned at p. 362. Blood in the urine may originate from different sources, which, as a general rule, can be recognised from the following considerations. If from the kidneys it is found equally diffused, giving to the urine a smoky reddish tint, and after standing some time a grumous-coloured deposit subsides. If from some other part of the urinary tract—*e.g.* if it comes from the ureter, bladder, or urethra—the colour is more bloody, more red, perhaps affecting only the part of the urine which is last voided in micturition, and frequently distinct clots are observed in the deposit. If the clots are large and readily distinguishable, and there is no history of an injury, we may safely infer that the blood is not from the kidney or the renal vessels proper; for in true hæmorrhage from the kidney, the coagula are formed within the renal tubes, and betoken their origin by the cylindrical casts and entangled blood-cells which they present. All urine containing blood is necessarily more or less albuminous.

By far the most common cause is congestion, due to some blow or injury in the renal region. It may also arise from acute Bright's disease, from malignant disease of the kidney or bladder, from the presence of a calculus in either the kidney, ureter, or bladder; or from the taking of irritating medicines, as turpentine or cantharides. Sometimes it is symptomatic, and dependent on other than urinary diseases. Thus it is seen in purpura and scurvy; or it may be found in yellow fever, cholera, or any of the eruptive fevers; and, when detected in the course of these diseases, the prognosis is most unfavourable. At other times it is supplementary either to a normal state or to a diseased condition, *e.g.* it may accompany menstruation in a woman, or a hæmorrhoidal flux in either sex. The endemic hæmaturia of the Mauritius and Brazil is dependent on the presence of a small parasite which infests the mucous membrane of the pelvis of the kidney, or the bladder.

Hæmorrhage from the bladder, due to acute cystitis, fungoid growth, or calculi, is usually recognised by symptoms referred to that organ, viz. very frequent micturition and pain in the hypogastrium. Urethral hæmorrhage is known by the escape of blood during the intervals of micturition.

Treatment will vary with the causes and circumstances of the hæmorrhage, but when our object is to treat the hæmaturia for itself—to stay the loss of blood—perfect rest is absolutely necessary, and the application of ice to the seat of the hæmorrhage. Thus if the kidneys are the seat, apply ice to the loins unless in nephritis; if the bladder, to the hypogastrium and perineum. In addition to this local application give astringents internally, *e.g.* acetate of lead gr. iii. in a pill every two hours, until six or eight doses have been administered; ol. terebinth. m. iii., mist. amygdalæ ℥j., every four hours; or injectio ergotæ hypodermica may be used, or tinct. cannabis indica.

In severe vesical hæmorrhage a solution of alum, 20 grains to the pint of water, may be injected into the bladder.

INTERMITTENT HÆMATINURIA.—*Synonyms*, Paroxysmal

Hæmaturia, Paroxysmal Hæmatinuria, Paroxysmal Hæmoglobinuria.

Intermittent hæmatinuria is a curious disorder, to which attention was first drawn by Dr. George Harley in 1865. The peculiar feature of the disease is the paroxysmal passing of dark-coloured urine, containing not blood but merely the colouring matter of the blood—hæmoglobin. A sense of shivering or cold about the loins precedes the paroxysm, which is sudden. The intervals between these are irregular, and there is no certainty about their occurrence; for sometimes the urine at one micturition is clear, and at another bloody-coloured like porter. The patient first experiences coldness of the extremities followed by general chilliness, accompanied by a feeling at the same time of malaise and a desire to stretch himself or yawn. Then is experienced a dull heavy pain in the loins, sometimes with tenderness over the region of the kidneys. These symptoms subside in a period varying from thirty minutes to two hours, after the passage of the dark-coloured urine, and the patient feels well until the occurrence of the next paroxysm. Microscopically, the urine presents chiefly an immense mass of amorphous granular matter, with dark-coloured granular tube-casts. The prognosis is favourable, though the duration of the disease cannot be defined. It gives the usual reactions of blood with guaiacum and Heller's tests.

In a case reported by me in the *Lancet*, January 1879, there was a fall of temperature preliminary to the rise when the paroxysm occurred.

The liability to paroxysmal hæmoglobinuria seems to be confined to males, age being from 20 to 48.

Cold is generally the exciting cause, and sometimes there is a history of malaria or of a previous injury to the back.

The pathology is obscure, but it seems to originate in the nervous system, and to be connected in some way, not precisely understood, with ague.

Treatment.—During the cold stage send the patient to bed, and administer warm stimulating drinks. Tonics, as iron and quinine, are also indicated (F. 76). Gull recommends ʒii. of tinct. cinch. co. three times a day; Hassall, gallic and tannic acid powders night and morning; Habershon, quinine and arsenic; while Begbie found attacks prevented by 20 grains of sal-ammoniac three times daily.

Chyluria.—By this term is meant the simultaneous appearance of fat and albumen, apart from the manifestations of other morbid conditions such as casts, renal epithelium, etc. Usually the sediment contains in small numbers red and white blood corpuscles.

The urine under these circumstances tends to form coagula of fibrin on standing, and occasionally it becomes completely gelatinous. As yet chyluria has been met with almost exclusively in persons who have lived for a long time in the tropics, and it has been shown to depend upon the invasion into the urinary tract of the *filaria sanguinis hominis*, or the filaria Bancrofti, the name employed to designate the adult worm, which was discovered by Bancroft of Brisbane. The embryo of this parasite is generally found in the urine, and it appears that the abnormal condition of the urine is due to unnatural communications between the lymphatics and the urinary passages affected by filaria.

The parasite, as a rule, is detected in the urine and in the blood when the patient is asleep. The average length of the embryo is $\frac{1}{75}''$ = (0·34 mm.); its breadth $\frac{1}{3500}''$ = (0·007 mm.), or equal to the diameter of a blood corpuscle. It is enclosed in a transparent tubular sac, which is extremely delicate and translucent, and in which the parasite can be seen to contract or elongate itself. After death the worm may occupy the whole of the sac, or it may shrink and leave the tube empty at one or both ends.

It has been recently shown that embryo filariæ in the blood are imbibed by the mosquito, which shortly resorts to water to deposit its eggs, and having achieved this object of its existence, expires; not, however, before it has digested the greater number of the filariæ. It has been supposed that the embryo passes the next stage of its existence as a free nematode, but can only attain its full sexual development by entering the human body; it is believed to accomplish this by penetrating the skin of bathers, and to attain sexual maturity in a short time within the body, the conjunction of the sexes taking place in the lymphatics. Some also suppose that it may gain an entrance into the body by the eating of salads to which the ova of embryos adhere.

Symptoms.—There seem to be no marked premonitory symptoms of chyluria, yet previous to voiding urine the patient may complain of a dull aching pain in the loins, along the ureters and over the bladder; or along the course of the urethra in males. With this there may be marked general debility and lowness of spirits. The urine presents the colour already mentioned, and frequently a strong milky or whey-like odour is perceived, which heat increases.

Sometimes during micturition the flow of urine is stopped by the blocking up of the urethra with clots. The sp. gr. may range from 1007 to 1020. Shaken up with ether the urine loses its milky aspect, and when nitric acid and heat are applied a precipitate almost invariably results, evincing the presence of fat, albumen, and fibrin. *No casts* have, however, been detected, and the fat chiefly characterises the urine passed after meals.

Chylous urine is more common in adults than in children, in females than in males, and its presence is not inconsistent with fair health. The disease runs a chronic course, and intermissions are not uncommon. A cure, however, can hardly be prognosticated, as the symptoms are apt to return. Patients in otherwise good health with chylous urine sometimes die suddenly from no recognised acute disorder. In persons afflicted with chyluria, who have died, no kidney disease has been detected. Nothing has been found in any of the organs or tissues suggestive of the cause of the urinary derangement, except the fact that all the vessels—arteries as well as veins—in their minutest ramifications contained the filaria.

Treatment.—Osler recommends a dry diet and avoidance of excess of fat. Surgical removal of enlarged glands containing the adult worms is sometimes useful.

BILHARZIA HÆMATOBIA.—The parasite Bilharzia, so called from its discoverer Bilharz, is an ovoid-shaped, soft-skinned, bisexual entozoon of the nematode or fluke type, the male being half an inch and the female three-quarters of an inch long. The parasite lives in the venous system, particularly in the portal vein and in the veins of the pelvis of the kidneys, spleen, mesentery, ureter, and bladder.

Egypt and the Cape of Good Hope are the countries where the affection is chiefly seen; and it is believed that it originates the endemic hæmaturia observed there and in other hot climates. The fact that wives of infected husbands have healthy children negatives its being considered a contagious disease.

Its *symptoms* vary. If in the liver, it gives rise to indigestion. If in the ureter, its effects are most destructive, as it leads to narrowing of the duct at the affected spot, causing obstruction to the flow of urine, hydronephrosis and pyelitis. It is, however, mainly vesical in its origin, and at the end of micturition a teaspoonful of dark blood or shreds of mucus are passed. In these shreds the ova of the parasite are found, and on masses of these ova urinary concretions or calculi may form.

Treatment.—When the bladder is alone implicated, good results have been obtained by Dr. Harley from daily injections of 20 to 30 grains of the iodide of potassium in 5 ounces of tepid water. With advantage also the same authority prescribed oil of male fern and oil of turpentine every morning, and by this mixture caused the expulsion of large numbers of the ova. The administration of alkalies tends to check the formation of calculi. Prophylactic measures against endemic hæmaturia are—

Water conveyed in *covered channels* from its source to its destination; filtering it before drinking, and bathing in it; and avoiding carefully taking uncooked salads, molluscs, and smoked fish.

RENAL CALCULUS AND GRAVEL.—Uric acid, according to Sir W. Roberts, exists primarily in the urine as a quadrurate, and in health as a quadrurate is discharged in its original state of complete or almost complete integrity; but in certain conditions within the body the quadrurate is precipitated as uric acid. The conditions which tend to accelerate this change are, according to the same authority:—(1) High acidity; (2) poverty in salines; (3) low pigmentation; (4) high percentage of uric acid. And conversely the conditions which tend to postpone precipitation are:—(1) Depressed acidity; (2) richness in salines, especially of potash salts; (3) richness in pigments; and (4) a low percentage of uric acid. On the interaction of these factors the occurrence or non-occurrence of gravel appears to depend; and probably the most important of these factors is the grade of acidity.

Small concretions which may be passed by the urethra are usually termed "gravel"; while larger masses are known as "calculi," or "stones." The varieties of renal calculi are:—(1) Uric acid, which is the most frequent constituent of renal calculi; (2) urates are rare, usually small and soft, and are nearly always confined to children; (3) phosphates; (4) oxalate of lime; (5) carbonate of lime; (6) cystin; (7) xanthin; (8) fibrin or blood; (9) indigo.

Clinical History.—When there is merely gritty matter no pain whatever may be experienced, but when the passage of a calculus down the ureter to the bladder is impeded it constitutes what is termed a "fit of gravel" or "renal colic." The pain is then sudden and excruciating, and accompanied by great restlessness, nausea, or vomiting. No posture gives relief, and a cold sweat breaks over the body. There are frequent desires to micturate, but little urine passes, and it may be deeply coloured with blood. The testicle on the side of the pain is retracted, and the disturbance of the nervous system may culminate in delirium and even epileptic convulsions.

These symptoms last for a variable time, sometimes only for an hour or two, sometimes for several days, and when fortunately the stone reaches the bladder, great relief is experienced. Shortly afterwards the calculus may be passed by the urethra. But if it becomes impacted it may occasion hydronephrosis, or pyelitis, or fibroid contraction and atrophy of the kidney.

Treatment.—In severe cases the patient should be placed in a warm bath for a time and then removed to bed. Warm fomentations or poultices should be applied to the loins and front of the abdomen. He should be encouraged to drink freely of warm water. Our chief reliance, however, must be placed in the subcutaneous injection of morphine in large doses and frequently repeated. In the most distressing case I ever saw, the inhalation of chloroform during the paroxysms of pain was the only method of treatment which gave relief. A visit to Carlsbad or Ems is often useful to prevent a recurrence; and if it be supposed that a uric acid calculus lies in the kidney, Sir William Roberts recommends the use of the citrate of potassium in large doses (F. 39*a*). If the patient's health seems to be undermined by constant pain and discharge of pus the advice of a surgeon should be sought.

DISEASES OF THE NERVOUS SYSTEM

In describing diseases of the nervous system we shall proceed on the following plan :—

1. A brief consideration of the anatomy and physiology of the brain and spinal cord, methods of investigating the symptoms motor and sensory of nervous diseases, with explanation of terms in general use, reflexes, the special senses, electricity, instructions for general diagnosis, electro and general therapeutics.

2. Diseases of nerves: neuritis (inflammation of the nerve-fibres), diseases of cranial nerves, diseases of the spinal nerves.

3. Diseases of the spinal cord: (1) affections of the meninges, (2) affections of the blood-vessels, (3) acute affections of the spinal cord, (4) chronic affections or degenerations of the spinal cord.

4. Diseases of the brain: (1) affections of the meninges—(*a*) of the dura mater, (*b*) of the pia mater; (2) affections of the blood-vessels; (3) affections of the substance of the brain; (4) tumours; (5) degenerations of the brain; (6) general and functional diseases.

LOCALISATION OF FUNCTION

Recent researches and experiments, especially those of Ferrier, have conclusively shown that there are localised areas in the brain, disease of which gives rise to certain symptoms during life. The brain has accordingly been divided into a motor and a sensory zone. The motor zone includes the central convolutions, or those bounding the fissure of Rolando, viz. the ascending and superior parietal convolutions; the ascending frontal and the posterior extremities of the superior, middle, and inferior frontal convolutions; and the paracentral lobule.

In this zone are defined centres for the movements of the limbs, head, eye, muscles of expression, and those of the mouth and tongue. The relative position of these centres in the motor area, viewed in the light of the parts they preside over, is as it were reversed. Thus the centre for the leg is uppermost, while that for the face is lowest; and again, owing to the decussation of the fibres in the medulla, the left motor area is concerned with the movements of the muscles of the right side of the body, and *vice versa.*

SENSORY ZONE.—Various experiments have shown that in regions lying posterior to the motor zone there exists a sensory zone, in which there are differentiated centres or areas for sight, hearing, smell, and taste. The visual centre is situated in the angular gyrus, and embraces also the occipital lobe—the occipito-angular region; the auditory area is localised in the superior temporo-sphenoidal convolution; the olfactory centre and centre for taste at the lower part of the temporo-sphenoidal lobe. Destructive lesions of these sensory centres must be bilateral; if simply one-sided they are, according to present experience, unaccompanied by any objective symptoms. Further, no secondary descending degeneration of the spinal cord has been observed in these cases. There is, moreover, reason for believing that some morbid irritations attack the sensory zone, which is evidenced by symptoms in certain nervous diseases, as the hallucinations of insanity and the auræ of sensations of light and colour or of disagreeable tastes and odours, which may precede an epileptic fit. Much obscurity has been cleared away by these investigations, and much misconception abolished, yet elaborate localisation can never efface the broad view that the brain acts as a whole in the healthy organism of a human being. This great fact should not be forgotten when we consider the complicated symptoms and diverse views sometimes deduced from these by leading neuro-pathologists.

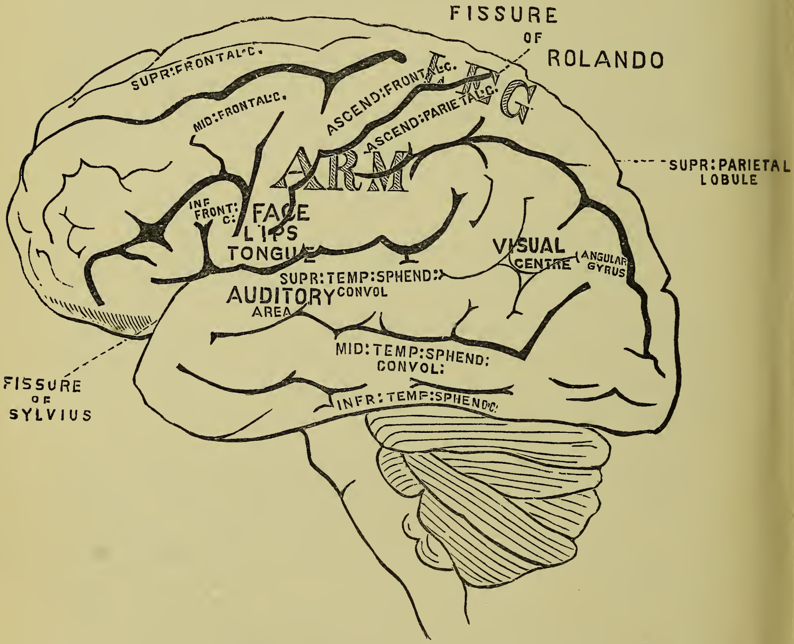


Fig. 18.—Cerebral Localisation.

Spinal Cord.—The spinal cord is the great medium for conducting nervous energy from the encephalon to the body. It is not a single organ, but is complex in structure and function. It serves as a medium to convey from or to the cerebrum motor and sensory impressions. It is continuous with the medulla oblongata, and begins at the upper border of the first cervical vertebra, and ends in a pointed extremity opposite the upper part of the second lumbar vertebra. In its whole course it is enclosed within the spinal column, and is invested by two membranes, pia mater and arachnoid. Beneath the latter membrane, and in the meshes of the pia mater, lies a certain amount of what is termed cerebro-spinal or subarachnoid fluid. Outside the arachnoid, and enveloping the cord more loosely, is the firm spinal dura mater.

ANATOMICAL STRUCTURE.—The anatomical structure is similar throughout the whole extent of the cord. It is double. The two halves are marked off from each other by a longitudinal fissure anteriorly and by a septum of connective tissue posteriorly. Each half contains a mass of gray matter. These gray masses are turned back to back, and are made continuous by a bridge of nervous matter constituting the GRAY COMMISSURE.

In front of this bridge of gray matter lies some white matter which forms the WHITE COMMISSURE.

Through the centre of the gray commissure runs a fine central canal—the CANAL OF THE CORD—lined with a layer of epithelial cells.

The thick anterior extremity of the gray matter in each half of the cord is known as the ANTERIOR CORNU, and the much thinner posterior extremity as the POSTERIOR CORNU. The posterior cornu approaches near to the surface of the cord in the posterior lateral region, and is here joined by the posterior roots of the spinal nerves. Their points of entry on each side divide the white substance of the corresponding half of the cord into posterior and antero-lateral columns. The portions of the white substance of the cord lying behind and between the posterior roots constitute the TWO POSTERIOR COLUMNS, each of which is again subdivided by a slight superficial fissure into an external tract or POSTERIOR EXTERNAL COLUMN, and an internal wedge-shaped portion or COLUMN OF GOLL.

The portions of the white substance which on each side lie in front of the posterior roots constitute THE ANTERO-LATERAL COLUMNS.

There is no real line of demarcation to define the bounds of the anterior and lateral columns respectively, for the anterior roots are connected with the anterior cornua in a diffuse manner, and do not form a compact bundle like that formed by the fibres of each posterior root.

From Dr. Gowers' Manual, by permission.

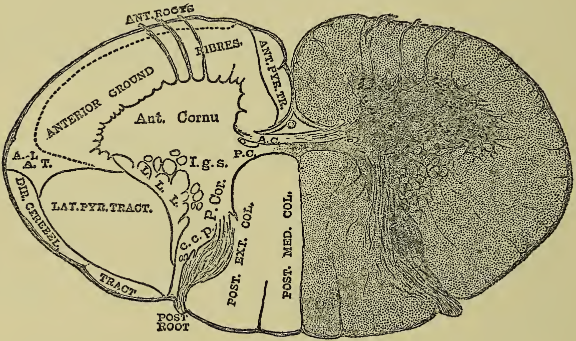


Fig. 19.

Diagram of a Section of the Spinal Cord in the Cervical Region.

A. C., Anterior commissure; *P. C.*, posterior commissure; *I. g. s.*, intermediate gray substance; *P. Cor.*, posterior cornu; *c. c. p.*, caput cornu posterioris; *L. L. L.*, lateral limiting layer; *A-L. A. T.*, antero-lateral ascending tract, which extends along the periphery of the cord.

Blood-Supply of the Spinal Cord.—The principal arteries of the spinal cord are the anterior and posterior spinal arteries—branches of the vertebral artery. Apart from these vessels, the blood-supply of the cord comes from still smaller twigs, derived from the intercostal and lumbar arteries, which anastomose with and reinforce the anterior and posterior vessels at intervals, along the whole length of the cord.

A peculiarly tortuous network of veins surrounds the spinal cord on all sides, and there is a natural slowness of the blood-current which is aided by many causes, bearing upon cardiac and respiratory action, as deep emotions or efforts, or distinct diseases of the respiratory or cardiac systems.

From the anatomy of the spinal cord thus described the question may be asked, Which of these parts act in conducting impressions to or from the brain?

The answer to this is, broadly speaking, ANTERIOR-MOTOR, POSTERIOR-SENSORY,—anatomical facts easily remembered by the statement that the letter "s" occurs in the word *posterior* but not in *anterior*.

Impressions of touch, temperature, pressure, and tickling are conveyed to the brain by the posterior columns.

The path of impression from muscles to the cerebrum is also found in the posterior columns, so also are carried to the brain the impressions from the genital centres in the lumbar region.

It is said that, although impressions from the sexual organs, the perinæum, and anal regions are carried up by the posterior columns, yet other impressions from the lower extremities are conveyed by the lateral instead of the posterior columns.

The outgoing channels of conduction from the brain to muscles below the decussation of the pyramids are found chiefly in the posterior part of the lateral columns. The fibres descend through these columns to different levels, according as these stimuli are destined to evoke the activity of different nerves and muscles.

Thus, to excite movements in arms or legs, motor fibres penetrate the gray matter (anterior horns) of the cervical enlargement in the former case, of the lumbar swelling in the latter. They now come into relation with some of the great nerve-cells contained therein, whence outgoing fibres arise and constitute the fibres of the anterior roots.

MOTOR SYMPTOMS

These consist of paralysis, spasm or convulsions, contracture, and incoördination. Paralysis means loss of voluntary motion in the muscles, and is mostly due to lesions of the nervous system. If of spinal origin it is termed *Paraplegia;* then there is paralysis of the legs, or of the legs and trunk. The lesion generally involves both halves of the spinal cord, and both sides of the body are as a rule equally affected up to the seat of the lesion in the cord.

The arms are not usually affected, but control over the bladder and rectum is more or less lost.

If the lesion be of lesser degree, if there be incomplete loss of movement, then it is called *paresis* or partial paralysis.

If there be paralysis of one side of the body it is called *Hemiplegia*, and its origin is then from the cerebrum. It is due to a lesion which as compared with the limbs or face affects the opposite cerebral hemisphere. This is explained by the decussation of the fibres in the medulla oblongata. Ordinary hemiplegia is occasioned by a lesion of the pyramidal tract in the middle portion of the internal capsule, and a destructive lesion in any part of this tract results in *persistent hemiplegia;* if only slightly deranged by disease in the neighbouring parts of the brain the hemiplegia is *temporary.*

Smaller lesions may occupy only particular motor centres of the cortex which are more or less separated from each other, and a sharply localised lesion in this region causes a more limited paralysis and gives rise to the forms of paralysis called *Monoplegiæ.* But even in this case the paralysis is more or less diffuse, affecting the whole limb or a segment of the limb and not individual muscles. Thus a disease of the facial centres results in paralysis (on the opposite side) of the facial muscles only (facial monoplegia); and in a corresponding manner there may be a *brachial monoplegia* or a *crural monoplegia.*

Aphasia literally means loss of speech, and true motor aphasia depends upon a lesion of the posterior part of the inferior or third left frontal (Broca's) convolution.

Anarthria implies gradual loss of the power of articulation, and with this there is difficulty in swallowing. It is dependent upon disease of the medulla and is designated Bulbar Paralysis.

SPASMS are involuntary muscular contractions. The most general division that can be made of spasm is into TONIC and CLONIC spasms. By the term Tonic Spasms are understood persistent and almost equable muscular contractions of great intensity, lasting for a considerable period (minutes, hours, or days), by which the limbs are kept in a state of rigidity. The simplest form of tonic spasm is CRAMP, evidenced by a persistent violent painful contraction of some single muscle, or group of muscles, as cramp of the calf of the leg, or of the muscles of mastication (trismus). A peculiar form of spasm is seen in catalepsy: here certain muscles, or groups of muscles, remain immovable in a condition of moderate contraction, over which contraction the will has hardly any influence, but which can be overcome with some ease by passive movements. By the term Clonic Spasms are understood rapid successions of contractions and relaxations of the muscles by means of which different parts of the body are often kept in a state of continual and frequently very lively movement—these movements, however, being separated from one another by intervals of sufficient duration for each excitation to be separately recognised. Among tonic and clonic spasms there are several well-defined forms which may be briefly mentioned. The mildest form of clonic spasm is TREMOR or QUIVERING, consisting of movements successive in character but of limited intensity and range. They may be the result of old age, or paralysis agitans; or they may be associated with certain poisons, as lead, mercury, or alcohol. Spasmodic, uncertain, purposeless movements which may occur on the simple desire to make a movement, and which also accompany movements performed voluntarily, are characteristic of chorea, and termed "choreiform."

Higher and more extensive forms of spasms are CONVULSIONS, which we recognise by energetic contractions at short intervals in particular groups of muscles, as twitchings of the face, movements of the head or body, startings of the eyes. If these convulsions affect the majority of the muscles, and occur in rapid succession in different parts, leading to extensive movements of the head and limbs, then they are termed "GENERAL CONVULSIONS"; they constitute the principal symptoms in epilepsy and uræmia.

Contracture.—This term indicates persistent and irremovable shortening, which lasts for weeks or years, and is frequently associated with certain trophic derangements of the muscles; this condition usually affects groups of muscles, as the flexors or extensors of particular joints.

Incoördination.—Muscular movements in a healthy person are performed in proper order, but in some forms of nervous disease there is a lack of order or ataxy. A healthy person can walk along a straight line but a person afflicted with ataxia cannot do this. His gait is perceived to be staggering, reeling, or waddling. He cannot turn round quickly. He cannot stand without inconvenience unless his eyes are directed to his feet; if his attention is directed to the ceiling, he totters and falls.

SENSORY SYMPTOMS

Deranged sensation is a very common symptom. It has often to be searched for, as a significant defect may be unknown to the patient. Each form of sensation—of touch, pain, and temperature—must be separately tested, since one may be affected and not another.

Tactile Sensibility.—The patient's eyes being closed, the observer's finger may be used, if it is not cold, or the skin may be touched with the feather end of a quill pen. He should be able to distinguish not merely that he is touched, but *when* and *where* he is touched. The part touched should be frequently varied.

Sensibility to Pain is subserved by what are called nerves of "common sensibility." It may be tested by a prick or a pinch. Nothing answers better for a prick than the point of a quill pen; and for comparing the sensibility of corresponding regions on the two sides, the faradic current with wire terminals may be employed.

Sensibility to pain may be changed with or without sensibility to touch. Its loss is termed "analgesia," but is often included under the general term "anæsthesia." A painful sensation is often felt more acutely than normal; this is called "hyperæsthesia," or more correctly "hyperalgesia."

Both tactile and painful impressions may produce sensations which are abnormal in character, described as "thrilling" or "tingling." This sensation has been termed "paræsthesia" or "dysæsthesia."

Sensibility to Temperature is usually affected with sensibility to pain, and for coarse examination hot and cold spoons may be employed. The temperature sense varies much in different parts. Sensibility to cold is least at the epigastrium, that to heat least on the back. In the leg, sensitiveness to both heat and cold is greatest at the knee, and lessens upwards and downwards.

Muscular Sensibility.—In some morbid conditions the muscular sense is lost and the patient cannot distinguish between light and heavy objects.

The chief tests for muscular sensibility are—(1) The power of discriminating differences in weight. The patient's eyes being closed he is asked to distinguish between weights of the same size and shape when placed in his hand. (2) The power of distinguishing the position into which the limb is put. (3) The sensitiveness of the muscles to deep pressure. (4) Their sensitiveness to electrical stimulation.

Kinæsthesis (κινέω, *I move;* and αἴσθησις, *sensation*)—the sense of movement.—Dr. Bastian says: "Every time a movement is executed we receive a group of sensorial impressions occasioned by and peculiar to the particular movement. This group of kinæsthetic impressions is made up in part of impressions emanating from the muscles in action, of others emanating from the joints moved, and of others coming from tendons, fasciæ and skin.

"These groups of sensations are registered as groups in definite portions of the cerebral cortex, and are capable of being revived in memory like other sensorial impressions. When so revived they constitute (with other related revivals in the visual centres) our 'ideas of movement.'

"Kinæsthetic impressions pass up through the spinal cord and the bulb; thence they pass through the posterior part of the internal capsule, and are registered in the Rolandic area of the cortex."

REFLEXES

Many symptoms of disease of the nervous system are due to derangements of the various reflex actions. Each action is effected through an afferent sensory nerve, an efferent motor nerve, and a system of nerve cells and fibres connecting the two in the spinal cord, the "reflex centre." The centre is usually a complex and often extensive structure, and in it are paths of different resistance, determining the form of reflex action and its extent, according to the source and intensity of the sensory impressions. The reflex centre is between the roots of the sensory and motor nerves concerned, and with them constitutes what may be termed a "reflex arc." The sensory impulse may not only excite a motor process, it may also pass up to the brain and affect consciousness as a sensation. Further, the reflex centre is to some extent under the control of the cerebral centres.

Two chief forms of reflex action must be distinguished, viz. (a) *Cutaneous* or *superficial reflex action*, (b) *deep* or *tendon reflexes.*

Cutaneous Action.—This is excited better by gentle stimulation of the skin than by a strong painful impression. At almost any part of the skin cutaneous reflex actions may be excited, but at some parts they are very definite in character and are distinguished by special names. The most important are:—*plantar reflex*, from the sole on stimulating the sole of the foot, the foot and leg are drawn up; *gluteal reflex*, a contraction in the glutei on stimulating the surface of the buttock; *abdominal reflex*, by scratching the abdomen along the outer border of the rectus; *cremaster reflex*, a retraction of the testicle when the skin on the inner part of the thigh is scratched or slightly stimulated.

In the region of the cranial nerves the most important reflexes are those of the eye, the conjunctival reflex, the contraction of the iris on exposure of the eye to light and its dilatation on stimulation of the skin of the neck.

Dr. Gowers' tables show the segment or segments of the spinal cord to which each reflex corresponds.

Reflex	Segment of Cord corresponding to
Plantar	1st to 3rd sacral nerves,
Gluteal	4th and 5th lumbar and 1st sacral nerves,
Abdominal	8th dorsal to 1st lumbar nerves,
Cremasteric	1st to 3rd lumbar nerves.

Deep Reflexes.—These are the *patellar tendon reflex* or *knee-jerk* and *ankle-clonus.* To obtain the knee-jerk, the knee must be flexed so that the quadriceps femoris is gently extended and the leg must be free to move. It is generally well obtained in the sitting position by crossing one leg over the other and striking the upper knee immediately below the patella with the ulnar edge of the hand, when the foot will be jerked sharply forward. When the reaction is slight the patient should sit on a table with the legs hanging over the edge and the knees bare. Sometimes this reaction is in excess, and this may be conveniently brought out in a different way. As the patient lies in bed, the finger of one hand is placed across the quadriceps tendon just *above* the patella, and the patella pushed down, so as to make the quadriceps tense. The finger is then percussed in the direction in which the patella is being pushed, so as suddenly to increase the tension in the muscle. The blow is instantly followed by a contraction, jerking the patella and finger upwards. Very often this single contraction is succeeded immediately by a second and this by a third.

Ankle-clonus is a similar phenomenon which occurs in certain spinal and other diseases, but *is not like the knee-jerk present in health.* To elicit this the patient should be in bed or in a chair; the leg is lifted with the left hand, and the foot, held firmly by the toes in the right hand, is forcibly bent towards the knee. Immediately the calf muscles contract, but as the pressure on the foot is maintained, they relax, again contract, and so alternately contract and relax for an almost indefinite period, constituting the so-called clonus.

The segments of the cord concerned in these movements are those which correspond, for knee-jerk, to the third and fourth lumbar nerves; for ankle-clonus to the fourth lumbar and first sacral nerves.

CHANGES IN NUTRITION

The nutrition of the tissue elements is largely under the influence of the nervous system, and nutritive changes in the skin, in the muscles, in the bones, and in the nerves are observed in diseases of this system. Such nutritive changes are termed Tropho-neuroses. Nutritive changes in the skin are readily recognised, but they differ much in their character according to their acuteness. Very intense changes in nutrition are common in acute inflammation of the spinal cord, or acute irritation of its nerves. The temperature of the limb is raised, the vessels readily dilate, and remain dilated for a long time, bullæ form, and slight pressure may occasion a slough. The alterations in nutrition in chronic lesions have been carefully studied by Paget and Weir Mitchell, and their observations show that there is a slow change in the nutrition of the skin, which becomes thin, red and shiny—the "glossy skin" of Paget.

Diseases of Joints and Bones.—Certain diseases affecting the cord are also apt to be associated with chronic diseases of the joints. These diseases affect ill-defined sites in the cord and they are sometimes comparatively unimportant, but at other times they may lead, as in some advanced cases of locomotor ataxy, to great atrophy of the articular ends of the bones and possibly to dislocation and utter destruction of the joints. The bones may also suffer in their nutrition and break more easily than in health.

Peripheral Nerves.—If a nerve is injured or badly lacerated, changes occur in the myelin and axis-cylinders, which lead to *secondary degeneration* and to an atrophic condition of the muscles it is connected with. Thus from injury to the circumflex nerve in dislocation of the shoulder-joint the deltoid muscle may waste. The changes in nerve and muscles are more fully referred to under Neuritis.

SPECIAL SENSES

At times the testing of the special senses gives a clue to the condition of the centres in any case of nervous disease.

HEARING may be tested by a watch, and an examination by the speculum should be made of the auditory meatus.

SMELL.—One nostril may be closed and the patient directed to smell with the other, camphor or oil of peppermint.

TASTE may be examined by the application of salt to each side of the tongue alternately.

VISION. — The condition of the pupils should always be noted and their reaction to light and accommodation ascertained, and the presence of myopia or hypermetropia determined. The importance of a thorough examination of the optic disc with the ophthalmoscope cannot be over-estimated, and the student should make himself familiar with this instrument and the mode of using it by at least three months' attendance at an Eye Hospital. He will then understand what blurring of the disc means in the early stage of optic neuritis, for then ordinary vision is commonly retained and the patient is not aware of his vision being affected. To enter fully into the changes which occur in the optic nerve, and which can only be ascertained by special study, would, however, be foreign to the object of this work.

ELECTRICITY

Since the discovery by Galvani of the physical effect of an electrical current on the muscular system, electricity as a curative agent has been more and more recognised, until now no physician's armamentarium is complete without the means of applying it. A knowledge of the principles on which it is based, and its application especially to nervous diseases, therefore form a fitting introduction to the consideration of the individual diseases ranked as nervous.

Electricity manifests itself in two distinct forms—STATIC and DYNAMIC. Static electricity may be produced by rubbing a piece of amber with flannel, and this principle is applied to complicated machines now rarely used. This form of electricity occupied formerly a prominent place in therapeutics, but now it is seldom employed. Yet in hysterical cases it is said to be of considerable value, and we shall allude to the method of using it, as this brings clearly out the relations of Static and Dynamic electricity.

The *method of application* consists in placing the patient on an insulated table. A conductor from either pole is led from the machine to the patient, who is then said to become charged with this form of electricity. It can be discharged from the patient at any part of the body by simply making a connection with the earth. The simplest way is to place one end of a small brass chain over a particular part, and let the other drop to the earth. Another method is for the operator to take an insulated rod to prevent the electricity passing from the patient to the operator, and by tapping the patient in any desired part, the electricity is discharged from it. It will be seen that the conditions known as Static and Dynamic pass into each other, because this agent would be considered in the Static form as long as it remains in the patient's body, but the moment it is discharged it is in motion, and so becomes Dynamic electricity.

Dynamic electricity may be produced (1) by batteries; (2) by means of the dynamo; (3) by means of the thermopyle. When used in these forms it is spoken of as a *galvanic*, *constant*, or *continuous* current. If the current be made and broken it is spoken of as the *faradic* or *interrupted* current. The term *induced* electricity means the placing a wire or coil of wire in the line of the magnetic force of another current. A current is induced in the second circuit on making or breaking the first circuit, although there is no actual contact between the first and second. Hence most magnetic machines have what are called primary and secondary coils.

Any of the generators mentioned may be used for the constant or the interrupted apparatus, but for medical purposes as a rule batteries are used.

The *production* of a galvanic current is dependent on the action which takes place between two plates of different metals. If two plates—one of copper, the other of zinc—are immersed in acidulated water, no action will be observed; but if the parts which are out of the liquid be connected, as with a wire, bubbles of gas (hydrogen) will be seen to collect on the part of the copper plate immersed, and the wire can be shown by suitable tests to have an ELECTRICAL CURRENT flowing through it. Such a combination is termed a GALVANIC CELL, and a number of these would form a BATTERY. The two plates are the ELEMENTS, and the parts to which the wires are attached are the POLES of the battery. The zinc is termed the POSITIVE ELEMENT but NEGATIVE POLE, the copper the NEGATIVE ELEMENT and POSITIVE POLE.

Whatever form of constant current be employed, it is essential that the three factors now in common use should be clearly understood. These are (1) electromotive force, written E.M.F.; (2) current, written C.; and (3) resistance, written R. To bring clearly before the mind the conception embodied in these terms we may compare the current with the flow of water through a pipe. Given a tank of water and a pipe leading from it to a lower level, the water flows down the pipe because the pressure above any point is greater than at any point below. The pressure is at its maximum at the inlet and falls to zero at the outlet. Further, a certain quantity of water flows per minute, depending upon the friction and upon the flow of water in the pipe. Three ideas from this illustration are conveyed—*first*, the pressure producing the flow; *secondly*, the rate of the flow or current; *thirdly*, the friction or resistance opposing the current.

To compare these with the electrical phenomena, the E.M.F. is likened to the aqua-motive force or water pressure or gravitation. The current is comparable with the rate of the flow and the friction to the resistance which all bodies more or less offer to the passage of the current.

The continuous current battery ought to be provided with some arrangement such as a *dial collector*, by which additional cells may be gradually added to the circuit, and a *commutator* or mechanical arrangement for reversing the direction of the current. A *galvanometer* or *measurer* is also necessary in order to gauge the strength of the current. It may either be attached to the battery or independent of it, but included in the circuit. This measurement of currents is an important and recent change in the application of electricity, for previous to its adoption it was customary to speak of the number of cells employed. As the current from these varies from second to second, it will be readily seen that it was a very unreliable method.

Whatever the source of electricity may be, it should be *measured* in *ampères* or fractions of ampères, and for medical purposes the galvanometer should range from 1 to 30 milliampères. Edleman's apparatus can be recommended. Apostoli's method of treatment requires a special form registered to 300 milliampères, and he recommends Gaiffe's.

The E.M.F. has for its unit the volt. The current is measured in ampères or fractions of an ampère (say milliampères), and the resistance is measured in ohms. The relation between the various units was first worked out by Dr. Ohm, and he formulated the law $\text{C.} = \frac{\text{E.M.F.}}{\text{R.}}$; and as there is a resistance inside the battery as well as in the wires forming the outer circuit, the law is further amplified into $\text{C.} = \frac{\text{E.M.F.}}{\text{R}' + \text{R}''}$.

Understanding this formula, we can easily name the current required for any work in practice. We can understand if we wish to stimulate a nerve or muscle, say in the arm, by passing a constant current through the tissues of the body, as from the hand to the side of the neck; then it is evident the force we wish to have at our disposal must be such as to overcome the great resistance of the human body between these points. In other words, we require a high E.M.F., possibly thirty or forty volts, but a very small current, thus a fraction of an ampère is only necessary. If we wish to heat a piece of platinum for a cautery point or snare, the small piece of platinum offers little or no resistance to the current, and so a low E.M.F., say four volts, is all that is necessary; but, on the other hand, to gain the necessary heat we may require as many as thirty ampères of current.

The following table may be useful in choosing a battery, and any one by its use can let an electrician understand what is wanted, and the choice of the means of producing the current becomes only a matter of convenience and expense. But with reference to this we may say that at present Leclanché, Daniell, or some form of the bichromate of potash batteries are employed in medical practice and the treatment of uterine fibroids. In surgery, for lighting or heating, bichromate of potash batteries with large elements are used, or, still better, secondary batteries, which are more convenient and reliable.

TABLE OF CURRENTS WHICH MAY BE REQUIRED IN THE DIAGNOSIS AND TREATMENT OF AFFECTIONS, SURGICAL AND MEDICAL (Macintyre).

	E.M.F.	CURRENT.
Diagnosis and treatment of lesions of nerves and muscles . . .	1–60 volts	1–20 milliampères
Removal of nævi, cysts, etc. . . .	20–40 „	1–30 „
Uterine fibroids (Apostoli) . . .	20–40 „	250 „
Lighting of cavities	5–20 „	1–3 ampères
Heating cautery points, loops, etc. . .	5 „	20 „

Every battery should be provided with a *rheostat*—an arrangement for regulating the current by introducing into, or removing from, the circuit more or less resistance.

No practical method has yet been devised for measuring the interrupted current. We must therefore compare contractions produced by its agency with those produced in a corresponding muscle in a healthy subject. Experience gained in this way from the habit of making electrical examinations will teach an operator what corresponding current ought to produce a contraction in any particular muscle that has to be tested.

The best forms of faradic batteries now in use are those in which the inducing current is obtained from one or two galvanic cells. For testing the contractile property of muscle, the primary coil is the better, as the secondary produces a current of higher tension, and is therefore more painful; but the secondary current is to be preferred for testing electro-sensibility.

For the use of both batteries, continuous and interrupted, it is necessary to have *rheophores* or conducting cords from the battery to the patient. At the ends of the *rheophores*, for the purpose of applying the current to the patient, it is necessary to have instruments of various sizes and shapes called *electrodes.* The size employed should always be registered. Erb has standard sets, and it is convenient to make use of these, as they are generally used and the numbers understood.

Certain symbols are used in connection with the constant current, and to understand these properly we have introduced a woodcut, which, elementary though it be, will make the following remarks more plain.

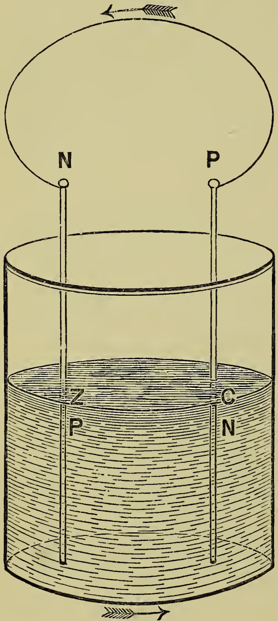


Fig. 20.

THE CURRENT FROM A CONSTANT-CURRENT BATTERY ALWAYS FLOWS FROM THE POSITIVE TO THE NEGATIVE POLE —that is, FROM THE ZINC TO THE COPPER WITHIN THE LIQUID, AND FROM THE COPPER TO THE ZINC WITHOUT. It is called a *descending current* when the positive pole is made the indifferent electrode (see p. 11). When the polarity of the electrodes is reversed for the purposes of diagnosis it is assumed that the current flows in a reverse direction, and it is then called an *ascending current.* Faraday called the positive pole the ANODE and the negative the CATHODE. In the reactions of healthy muscle to the continuous current a stronger contraction is produced on closing a descending current than on closing an ascending current; or, in other words, a stronger reaction is produced in a muscle when the electrode applied to it is negative than when it is positive, *i.e.* a cathodal closure contraction is stronger than an anodal closure contraction. This is expressed by the formula C.C.C. >A.C.C.

The reverse of this reaction occurs in "the reaction of degeneration," Erb's definition of which is "*a diminution and loss of faradic excitability in both nerves and muscles, while the galvanic excitability of the latter remains unimpaired, or is sometimes notably increased and always undergoes definite qualitative modifications.*" The symbol R.D. is often used.

The normal polar reactions of nerves occur in the following order :—

C.C.C.	Cathodal closure contraction.
A.O.C.	Anodal opening contraction.
A.C.C.	Anodal closure contraction.
C.O.C.	Cathodal opening contraction.

The chief practical fact worthy to be noted is that in health the C.C.C. exceeds the A.C.C., and the A.O.C. the C.O.C.

Instructions for General Diagnosis.—The examination by electric methods proceeds thus. The limbs to be examined and compared should be placed in the same position, and if it be desired to ascertain the condition of the muscles, the skin over them should be moistened with salt and water. At certain points Duchenne found that muscles could be more easily excited. These points were afterwards proved to be the positions where the motor nerves entered the muscles, or for deep muscles, where the supplying nerve approached nearest the skin, and could therefore be more easily excited. These positions are now called the "motor points."

For the continuous current a pad forming one electrode should be placed on an indifferent part of the body, and the other electrode, applied to the muscle the condition of which it is necessary to ascertain, should be made alternately negative and positive by means of a commutator and the contractions produced compared. Then the contractions produced on the affected limb should be compared with those produced on the healthy side ; or if both limbs be affected, " a current registering 2 milliampères ought to produce a contraction."

In examining for faradic contractility the usual way is to apply one electrode to the trunk of a nerve, and the other to the individual muscles supplied by the branches of that nerve.

In testing the electro-sensibility of a part, one moist electrode should be placed on an indifferent part of the body, and the other, a dry one, such as a metallic brush, applied lightly to the part to be tested, the skin also being allowed to remain dry.

In the early stages of some paralyses the galvanic irritability is very often increased.

The interrupted current in electro-diagnosis is of as great use as the constant. When interruption takes place more frequently than ten times in a second, tonic contraction of healthy muscle is produced, provided a current of sufficient strength be used. When the motor cells at the origin of the nerves, or the nerves themselves, anywhere in the course of their distribution are impaired or destroyed, the contractility of the muscles they supply is either modified or lost.

By electricity we are often enabled to distinguish between paralysis due to central lesion and paralysis due to peripheral lesion. " We are accustomed to speak of a paralysis as 'central' so long as that portion of a nerve-centre is sound from which the nerves supplying the paralysed muscles take origin." Thus in cases of damage to one internal capsule, the spinal cord and the greater part of the brain being healthy, we speak of the case as one of central paralysis.

In such cases of central paralysis we find that—

1. Reflex stimulation of the muscles is possible.
2. The muscles undergo but little wasting.
3. The irritability of the muscles to faradism is scarcely diminished.

But if, on the contrary, we find the muscles cut off from communication with their nerve-centres, or communicating DIRECTLY with centres which have been sapped by disease, then we understand peripheral, not central, paralysis exists.

In such cases we find that—

1. The muscles waste very rapidly.

2. Their irritability to faradism is greatly diminished, if not destroyed.

These quantitative and qualitative changes in the action of muscles appear to depend upon degeneration, and are spoken of as THE REACTION OF DEGENERATION, the definition of which was given previously. This degeneration is found in some forms of paralysis due to degenerative changes in the cord; in spinal paralysis both of infants and adults; in traumatic paralysis due to injury of a nerve; in rheumatic paralysis due to thickening of the neurilemma; and in lead paralysis.

We must try to distinguish the *spinal* form from the *peripheral* disease on the one hand, and from the *cerebral* on the other. As an end to this the points to be mentioned are of practical importance.

1. The following circumstances are allied with a *peripheral* localisation: The disturbances being limited to single nerves or groups of nerves; exact coincidence of the disturbance, motor, sensory, vaso-motor, and trophic, with the distribution of a peripheral nerve; *absence of retarded conduction of sensation;* absence of weakness of the genito-urinary tract; certain results of electrical examination; presence of great disturbance of the trophic function; the existence of a known local cause of origin.

2. The following circumstances favour a *cerebral* location: Hemiplegia, with loss of sensation and motion on the same side; absence of all trophic disturbance; normal electric reaction; retention or exaggeration of all reflex acts; retention of the functions of the bladder and rectum; evident disorder of the higher senses and of various cerebral nerves; affections of speech and of the mental functions; presence of headache, giddiness, and vomiting not due to gastric causes (causeless vomiting).

3. The following circumstances favour a *spinal* seat of the disease: Paraplegia; in case of hemiplegic symptoms, crossing of motor and sensory disturbances; girdle sensation at the upper limit of the other disturbances; exaggeration or weakening of spinal reflex action; paralysis of the rectum; incontinence of urine; bed-sores; definite paræsthesia; retardation of the conduction of sensory impressions; absence, as a rule, of any implication of the higher organs of sense and of the cerebral nerves.

All these points possess by no means an absolute, but only a conditional value; their significance is not always decisive, except in connection with other symptoms and a careful reflection on all the circumstances brought under our notice. When we have decided that the cord is the seat of the lesion, then we have to LOCALISE this seat and the NATURE of the lesion. With regard to the nature, we may say that spasm, pain, and increased reflex action are symptoms of irritation, and lead us to infer a corresponding pathological state; symptoms of paralysis point to a more serious condition of disease, viz. degenerative processes, softening or compression, and destruction of the cord.

To aid still further a differential diagnosis, we will indicate characteristic gaits or walks in spinal affections. There are three leading varieties:—

1. The paretic and paralytic gait, caused by a more or less extensive palsy of the lower extremities. The gait is shuffling, the tip of the foot drags on the ground, and the sole is planted awkwardly, usually with the outer edge first. The patient walks with the aid of canes, or requires the support of crutches or attendants. He may be able to stand thus securely; but, when left alone, he in most cases simply sinks to the ground.

2. The ataxic gait, due to disturbance of co-ordination in the legs. The movements are hurried and characteristic. The point of the foot does not drag. It is thrown forward and outward, and the heel is brought down with a decided stamp while the leg remains stiff at the knee. The patient's eyes are directed to his feet, as in this way he can stand without inconvenience. But, if his attention is directed to

the ceiling, he totters and falls; and the same thing occurs if, when walking, he is asked to turn round quickly.

3. The stiff spastic walk, due to reflex muscular contraction or tension associated with paresis of the legs. The legs are dragged. The feet seem to cleave to the ground, and the tips appear to find inequalities even on a level surface. Every step is accompanied with a hopping movement of the body, which is slightly bent forward. The tendency is to walk on tiptoe, and there is no throwing about of the feet.

Generally speaking, the first variety is dependent on disease of the anterior columns of the cord; the second, of the posterior; while the third involves the lateral columns. The first two are often seen; the latter is rarer.

ELECTRO AND GENERAL THERAPEUTICS OF THE NERVOUS SYSTEM

Much has been said for and against the use of electricity in diseases of the nervous system. The following remarks are based in the main on personal observations.

Cerebral Hæmorrhage.—The effusion of blood in the substance of the brain, if not fatal, is followed by a clot or clots which may in the course of time be absorbed. It is very questionable if electrical treatment should be used to hasten this absorption. But no objection can be urged against this treatment being used to stimulate the paralysed muscles, for it is based upon the reasonable supposition that we wish to keep the paralysed muscles in a fairly healthy, well-nourished condition, so that if the central lesion be removed by absorption, the brain will have no trouble in evincing its power. The treatment must be by that current to which the muscles most readily respond. If the induced, then the induced current; if the continuous, then the continuous or constant current. Always employ the weakest current possible, so as to refresh, not to fatigue, the muscles. Repeat the application every other night, and operate systematically on each muscle implicated. Never commence this treatment until a fortnight has elapsed from the original paralytic seizure.

If paralysis to the will remains absolute, and if the contractility of the muscles be perfect, we do no good by electric treatment. If paralysis to the will remains absolute, and if the irritability of the muscles be diminished, electricity is useful, in so far as it helps to improve the nutrition of the muscles and to restore their normal degree of irritability.

If the irritability to both forms of current has completely disappeared, and if contractures have developed, it ill behoves the physician to hold out hope of recovery to the patient or to his friends. It is then necessary to explain to both that electricity or indeed any medicine will do no good, and that there is no possibility of cure.

PAINFUL AFFECTIONS.—In painful affections electricity does good. The galvanic current is found best for these, and the positive pole, according to some authorities, ought to be placed on the painful spot. Thus neuralgia of any type may be relieved, especially neuralgic headaches; protracted sciatica, and the later stages of neuritis, and multiple neuritis may be shortened, if not absolutely cured.

SPASMODIC DISEASES.—Tremor and writers' cramp are benefited by electricity.

PERIPHERAL PARALYSIS.—In lead palsy electricity materially assists recovery.

Apart from electro-therapeutics there are some broad remedial measures which time and experience have established as the best in diseases of the nervous system. We shall now refer to these.

Means which increase the blood-supply.—(1) Posture. The patient is placed on his back, his feet and limbs are raised, his head kept low, and the result is more blood is sent to the brain. (2) Compression of arteries is sometimes, though rarely, resorted to, as tourniquets to the femoral. (3) Stimulants. Alcohol, ammonia, food. (4) Paralysing the vaso-motor nerves. Special benefit is derived from inhaling nitrite of amyl.

Means which decrease the blood-supply.—(1) Venesection. Now rarely used, yet, without doubt, an admirable and safe remedy in plethoric cases. Leeches and cupping counter-irritate and diminish the blood-supply. (2) Position. Placing the patient on his face decreases the circulation in the spinal cord. In extreme cases of insomnia sleep may be obtained in the sitting posture. (3) Continuous cold. The application to the scalp and spine of pounded ice in a bladder is useful in cerebro-spinal meningitis and spinal inflammation. (4) Galvanism stimulates the vaso-motor nerves and produces anæmia; so also do ergot and belladonna. (5) Mental rest, light literature, pleasant conversation, and sweet music are important addenda to general treatment in diminishing the cerebro-spinal blood-supply.

Cerebral Excitants.—Alcohol, cannabis indica, opium in small doses, and belladonna.

Spinal Excitants.—Nux vomica or strychnine, and Easton's syrup, when there is not inflammation but nervous exhaustion, as in some cases of epilepsy and spinal irritation. Quinine is, to a certain extent, a cerebral excitant; and cantharides stimulate the lower part of the spinal cord in inertia of the bladder or genital organs.

Cerebral Depressants.—Cold and bromide of potassium occupy the chief place, the bromide being very valuable in sleeplessness and all forms of cerebral excitement. It is supposed to act by depressing the cerebral circulation and producing temporary anæmia of the brain. Hydrate of chloral cautiously given up to gr. xxx., either alone or with bromide, is valuable in insanity, but more recent hypnotics, as paraldehyde, sulphonal, and chloralamide, are justly superseding chloral. Opium, or the salts of morphine, either internally, or by suppositories, or hypodermically, are useful, unless there is an idiosyncrasy contra-indicating their employment, as in the case of some females.

Spinal Depressants.—Succus conii, ʒss. to ʒi. daily, is a most valuable preparation. Bromide of potassium and chloral also are of great service in various diseases; and in poisoning by strychnine, chloral is an undoubted specific.

Tonics and Restoratives.—Preparations of phosphorus and zinc occupy the foremost place as tonics and restoratives in nervous diseases. Next come fatty food and strychnia, arsenic, iron, quinine, and sea-bathing; while cold baths are useful if the reaction of the skin is good and no chill follows their employment.

Arsenic is specially serviceable in chorea. Quinine acts to some extent directly on the nervous centre; iron, indirectly, by raising the general tone and nutrition of the system. Constitutional syphilis with nervous phenomena is best treated by iodide of potassium with small doses of perchloride of mercury. Malarial neuralgia is checked by the hypodermic injection of quinine over the affected nerve (F. 11*d*).

Counter-Irritants.—Blisters, dry cupping, sulphur baths, and, within certain limits, faradic and galvanic electricity, are the means chiefly adopted as counter-irritants. The actual cautery and setons have fallen into disuse.

Massage.—Under this term certain distinct methods of manipulation are embraced, which we shall now briefly explain, premising that all the methods are done with the dry hand with or without the aid of oil or liniments:—

(*a*) *Effleurage.* This is the term applied to light stroking movements carried on in various ways, without exerting much pressure. (*b*) *Petrissage.* A portion of the muscle is picked up with the fingers and thumb of one or both hands; it is subjected to firm pressure and rolled between the fingers and subjacent tissues. Working from periphery to centre, successive portions are taken up one after another. (*c*) *Friction.* Rubbing the surface of a limb with the tips of the fingers. (*d*) *Tapotement.* Percussion with the tips of the fingers, the palmar surface of the tips, the palms of the hands, the back of the half-closed hand, the ulnar or radial border of the hand, or the whole hand, so as to enclose some air between it and the surface of the limb.

The duration of massage should be from ten to fifteen minutes on any one occasion, and in recent cases the sittings may be three or four in the day. While no mystery surrounds the process, yet the masseur requires to have soft yet firm hands, and good conversational powers. As carried out at Aix-les-Bains or Bath, it is materially aided by the use of the waters at these spas.

Method of Diet.—The diet must be strengthening, yet not stimulating. Milk, meat, eggs, light vegetables, puddings, and fluids are allowed and required; an abundant supply of fatty nutriment (butter, cream, cod-liver oil) is perhaps useful in a good many cases; strong seasoning and heavy dishes must always be avoided. A glass of wine or beer with food is in most cases advisable, but their excessive use is strictly forbidden. Strong tea and coffee must be avoided, while smoking in moderation is allowed.

Animal Extracts.—The evidence as to the value of these extracts is at present very contradictory. Some assert that organic diseases can thus be cured, others that they can only be relieved, others deny *in toto* their utility. Thus, injections of cerebrin prepared from the brain of an ox are stated by some to cure locomotor ataxy, progressive muscular atrophy, dementia, and bulbar paralysis; others state that the same results are achieved by injections of phosphate of soda (2 per cent in laurel water). We consider these statements hardly credible, for their truth would invalidate the careful records of pathology and the deductions made from these. Further, it appears that whether it is testicular fluid, brain extract, or heart extract which is injected, very much the same phenomena are produced. The value of extract of brain, cerebrin, etc., is probably *nil.* Testicular extract may have some slight general stimulant effect.

Mode of Life.—In conditions of hyperæmia and inflammation, Brown-Séquard directs the avoidance of lying on the back as much as possible. A moderate amount of exercise without fatigue is useful and desirable, but let the patient be warned against every excess of exertion, notably to cease walking when fatigue is felt. In all cases it is well to limit sexual indulgence, and in many to forbid it wholly. To secure sleep is an essential point, and in connection with this all exciting reading or conversation must be forbidden, especially in the evening. The clothing should be warm, to avoid catching cold. Hardening the system may be accomplished by sponging the body with cold water, while the feet stand in warm water.

NEURITIS

Neuritis or inflammation of the nerves may be localised in a single nerve, or many nerves may suffer at the same time (primary multiple neuritis). We shall consider first the localised form. The inflammation of single nerves usually begins in the outer sheath of the nerve (perineuritis). It may involve also, or chiefly, the connective tissue between the bundles of nerve-fibres (interstitial neuritis) or the nerve fibres themselves (parenchymatous or degenerative neuritis).

Causes.—Direct injury, as blows, fractures, wounds; by extension from adjacent inflammation, as suppurating joints, pleurisy, meningitis; exposure to cold, known as "rheumatic neuritis," or it may follow influenza or gout, or accompany syphilis.

Pathological Anatomy.—If neuritis affects only the connective tissue, the microscope shows leucocytes surrounding the vessels, infiltrating the sheath, and accumulating between it and the nerves. The nerve-fibres usually present little change unless the nerve lies in a bony canal or in rigid fibrous tissue within which the sheath cannot expand; its swelling then exerts pressure on the nerves. If the inflammation be interstitial the nerve-fibres suffer more readily, though not invariably. If the inflammation be parenchymatous then changes in the fibres occur, while the interstitial tissue is but little altered or only affected secondarily. The myelin becomes segmented and divides into small globules and granules, and the axis-cylinders become broken, subdivided, and ultimately disappear. The fibres are reduced ultimately to the state of atrophic tubes. The muscles connected with the degenerated nerves show marked atrophic changes.

Secondary Degeneration.—Injuries which cut off nerves from their centres cause important alterations below the lesion. These have been closely studied in animals, and similar changes follow neuritis, as well as direct injury in man. They consist of a degeneration of the nerve-fibres and atrophy or degeneration of the muscles supplied by them. The nerve degeneration known as "secondary degeneration" or "Wallerian degeneration" is similar in its nature to the parenchymatous inflammation just mentioned, and it may be accompanied by varying degrees of interstitial change.

From Dr. Gowers' Manual.

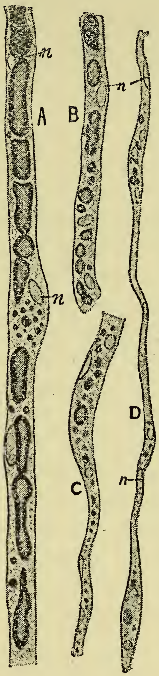


Fig. 21.

Degenerating fibres from cutaneous nerves of a man. *A*, from near a bed-sore in a case of fracture of the skull; *B*, *C*, *D*, from the fifth nerve in a case of neuralgia and ulceration of the lip; *n*, *n*, nuclei. In *A* the protoplasm and nuclei are increased, and the myelin is breaking up, the processes having proceeded furthest in the neighbourhood of the nucleus in the middle of the fibre; in *B* the segmentation has gone on to the formation of globules, which in *C* are, for the most part, small, and many have been removed, so that the fibre is narrow: while in *D* all the products of degeneration have been removed from considerable tracts of the sheath.

The muscles in connection with such injured nerves become flabby and lose bulk, the transverse striation becomes less distinct, and ultimately is lost or replaced by longitudinal striation, while the connective tissue between the fibres is increased. "Reaction of degeneration," referred to at p. 411, is now observed.

Regeneration. — More or less perfect regeneration may take place more readily after slight injuries; this begins at the central end by the growth of new axis-cylinders which afterwards become covered with myelin.

Symptoms. — In the *acute* form there may be some slight constitutional disturbance. But the most important symptom is pain, of an intense burning or boring character, usually felt in the course of the nerve, and the parts to which it is distributed. This pain is worse at night. The skin may be slightly red or swollen over the seat of inflammation. The muscles supplied by the nerve-fibres become weak and tender, and there may be twitchings or contractions. The epidermis may become thickened or atrophied as glossy skin. In the more CHRONIC forms there is no constitutional disturbance, and the pain is variable—sometimes intense and distressing, at other times causing little inconvenience. In both forms the muscles may waste and present the reaction of degeneration when they are tested with electricity.

The *duration* and *course* of neuritis vary much. A slight attack may run its course in a few weeks and then subside. Much more commonly the affection persists in a chronic stage for many weeks, or even months, and slowly passes off. The rheumatic and gouty forms are, as a rule, much more tedious than those that result from injury.

Prognosis.—The prognosis, as a rule, is best in traumatic neuritis. In all cases the intensity of the symptoms and the evidence of descending degeneration furnish a more trustworthy guide to prognosis than does the mere form of the affection. The effects of complete degeneration always endure for some months. Regeneration does not occur until the original cause has ceased to act, and the progress to restoration is slow.

Treatment.—The first indications in treatment of neuritis are the removal of the cause, if that can be discovered, and the prevention of all movements which cause pain. In *acute* cases, a brisk purgative should be given, and an unstimulating diet ordered. The limb may be steamed or exposed to hot air. This should be followed by hot fomentations along the course of the affected nerve, and these by linseed-meal poultices. In traumatic cases cold instead of heat should be used. During the subsidence of the inflammation small blisters, repeated mustard poultices, or stimulating liniments may be applied, care being taken not to blister the skin.

The hypodermic injection of morphine is the most potent sedative for the relief of pain. It has, however, no influence on the morbid process, as it only subdues pain by acting on the brain ; cocaine while lessening pain arrests also the local transmission of the impulses which cause pain, and the local character of its action is salutary on the morbid process. An injection of cocaine should be made at one of the seats of pain. Internally, mercury in small doses is the best remedy, as hyd. c. cretâ gr. ii. twice daily. For *chronic* cases counter-irritation should be employed, and electricity in the form of galvanism. It is not advisable to do anything to the muscles in cases of moderate severity. They will recover when the nerve recovers. If the wasting is, however, considerable, or there is degenerative reaction, they should be stimulated to gentle contraction by a weak, slowly interrupted, voltaic current.

MULTIPLE OR PERIPHERAL NEURITIS

Peripheral or multiple neuritis consists essentially of an inflammation and degeneration of the peripheral nerves. It affects both sexes and occurs chiefly during adult life. By far the most common cause is alcoholism, but the mineral poisons, as lead and arsenic, and the specific toxins of malaria, diphtheria, and leprosy, may also cause the disease. It occurs in cachectic conditions. In other cases it follows over-exertion or exposure to cold. It is also met with in naphtha and bisulphide of carbon workers. Beri-beri is a form of multiple neuritis which is endemic in some tropical countries.

Alcoholic neuritis is common in women who are quiet, steady tipplers. The onset is usually gradual. There may be a history of pain and tingling in the limbs. The muscles first affected are the extensors of the legs, which become flaccid and tender to pressure. The affected nerves are also very tender. Along with this there is frequently anæsthesia of the skin, and various other disturbances of sensation, as lessened acuteness of the perception of heat and cold. There is usually foot-drop. In many cases there is loss of patellar reflex. If the arms are affected there may be wrist-drop. In severe cases the muscles waste and the reaction of degeneration may be present. The parts affected are often swollen and congested. In some cases the onset is acute with high fever. In the alcoholic variety mental disturbance is frequently seen. The memory for present and recent events is defective. The appreciation of place is altered, a bedridden patient may give a circumstantial account of a journey he has never made. In partially recovered cases the gait is very characteristic. To avoid catching the toes the legs are lifted very high over obstacles.

Prognosis.—If due to lead poisoning, recovery, or at least permanent improvement, may take place. In most cases some improvement may be brought about by suitable treatment after the end of six months or a year. On the other hand, the disease may prove fatal within a short time.

Treatment.—Physical rest is of great importance, and in all cases, except the slightest, rest in bed is desirable. In the acute cases with fever, the salicylates and antipyrin are recommended, and to allay the intense pain, morphine or hot applications of liq. plumbi subacetatis dilutus and tinct. opii are often required. When the actual onset is over, and from the first in the more chronic cases, tonics answer best—iron, quinine, or small doses of strychnine. Great care must be exercised in the alcoholic form. It is better to reduce the stimulants gradually than all at once; and it is necessary, if circumstances permit, to place the patient under the care of an experienced and trustworthy nurse. If circumstances do not permit of this being done the patient should be removed to an hospital. In most cases to relieve pain anodynes are given. Cocaine injected is preferable to morphine, as it secures the double object of lessening the pain and the desire for stimulants. Cannabis indica can also be given regularly, and to secure sleep a solution of bromide of potassium and chloralamide is sufficient. Massage and the continuous current are of service during the slow process of recovery.

MULTIPLE NEURITIS in the infectious diseases. This has been referred to particularly in diphtheria and leprosy, in which it is most common. The disease in tuberculosis, diabetes, and syphilis is of the same nature, and is probably due to toxic materials absorbed into the blood.

LEAD NEURITIS.—This will be considered under lead poisoning (p. 519).

ENDEMIC NEURITIS (*Beri-beri*).—This is a widely-spread disease in certain parts of India, China, and Japan, and on the West Coast of Africa, where it is designated "the sleeping sickness." Two views are held as regards its etiology. The one school hold that it is an acute infection by some germ, while the Japanese observers claim that it is a toxæmia due to the use of bad rice or of a certain kind of fish. There are several types of cases. In the acute pernicious form the nervous phenomena are not so marked. There are fever, anæmia, and anasarca. In another group of cases there are numbness, loss of tendon reflexes, areas of anæsthesia, and muscular atrophy and anasarca. In other cases the disease is a clinical picture of rapidly increasing multiple neuritis with sensory and motor disturbances, first and chiefly in the nerves of the legs, and secondly in the cardiac branches of the vagus. The mortality varies from three or four to fifty per cent.

Treatment.—Europeans should use a rich nitrogenous diet. If attacked they should remove to a district where the disease is not endemic. For the attack, salicylates, free early purgation, and, in severe cases, blood-letting are recommended. Chronic cases require cardiac tonics, as small doses of digitalis.

DISEASES OF THE CRANIAL NERVES

We shall only attempt to give a short account of the most important and most common diseases of the motor and sensory nerves, as observed in hospital or general practice, for to enter in any detail into all the lesions of special nerves—motor or sensory—would be misleading and give to them an unnecessary prominence. We shall therefore, under lesions of the motor nerves, treat of facial paralysis and paralysis of the ocular muscles, and under lesions of the sensory nerves allude to paralysis of the fifth nerve and paralysis of the olfactory nerves.

FACIAL PARALYSIS or BELL'S PARALYSIS.—The most frequent *cause* of common facial paralysis is cold, and hence it is often termed "rheumatic." In more than half the cases special and considerable exposure can be traced, as sitting in a railway carriage opposite an open window or by working in a draughty shop. In many cases of facial paralysis in the subjects of syphilis the paralysis is distinctly excited by cold, and it is probable that the syphilis may have a predisposing influence. Ear disease is a common cause among children. It sometimes follows on injuries, as fracture of the base of the skull, blows on the ear, tumours growing from the parotid gland. In its course within "the Fallopian Canal" the nerve may be involved with scrofulous affections of the petrous bone or by tumours. On the cerebral side of the internal auditory meatus, or at its origin within the pons, it may be affected by morbid processes of various kinds.

Symptoms. — The appearances are characteristic. The muscles of half of the face become toneless and immobile; the lines of expression are lost; the eyelid cannot be closed and remains open; tears overflow the lower eyelid; the affected side takes no part in frown or smile; the cheek is puffed out on forcible expiration; and on the affected side food lodges between the teeth and the cheek. The paralysis becomes very apparent if the patient attempts to smile or whistle, or show his teeth or elevate his eyebrows. Owing to the fact that the lips are drawn to the sound side, if the tongue be protruded it appears to be pushed to the paralysed side, but on taking its position from the incisor teeth it will be found to be in the middle line. It was formerly supposed that the palate was paralysed on the same side and that the uvula deviated, but this supposition is now discredited because these parts are innervated by the accessory nerve to the vagus.

Diagnosis and Course.—The diagnosis of the seat of the lesion rests on the associations of the paralysis. If no nerve except the facial is affected and TASTE is unimpaired, the lesion is probably either outside the skull or in the lowest part of the Fallopian Canal. If *taste* is lost on the front of the tongue, the lesion is in the canal, and involves the nerve between the geniculate ganglion and the origin of the chorda tympani. This does not, however, prove that the disease began in this part; disease may spread to the chordal region. The taste is lost in about half the cases of paralysis from cold. Doubtless this is due to neuritis extending from its primary site. Erb first pointed out how the application of electrical reactions may aid diagnosis in *mild* and *severe* forms of facial paralysis. The facial paralysis which accompanies hemiplegia differs from Bell's paralysis by the great fact that the orbicularis palpebrarum is not involved so that the *eye can be closed.* In the *mild* form, which tends to get well in three weeks, the paralysed side responds to the electric current as readily as the sound one does. In the *severe* form, which includes a large proportion of those cases due to the direct action of cold, there is "the reaction of degeneration." No improvement in such a case can be looked for until two or three months have elapsed; and, even with recovery, which may be in a period of equal duration, there may be permanent weakness and stiffness of the muscles affected. Further, in paralysis of this nerve from central (cerebral) lesion there is no reaction of regeneration.

Treatment.—The persistent use of electricity is of great importance, one pole of the continuous current being placed over the point of exit of the nerve, while the other is applied in succession over the various muscles supplied by it. The healthy condition of the system should be secured by hygiene and tonics, especially strychnine. If there is reason to suspect a syphilitic taint, give iodide of potassium and mercury (F. 1).

PARALYSIS OF THE OCULAR MUSCLES.—Paralysis of the ocular muscles depends on affections which involve either the peripheral nerves or their nuclei in the brain. The peripheral variety will only be alluded to here, the causes of which are (1) Injuries; (2) Compression of nerves from morbid processes in their neighbourhood, as tumours, periostitis, syphilitic diseases of the nerves and their surroundings, aneurysms of the basilar artery, acute or chronic meningitis; (3) "Rheumatic paralysis," dependent on cold or exposure; (4) Acute diseases, as a result of diphtheria; or chronic diseases, as diabetes mellitus.

Symptoms.—Double vision or diplopia is noticed by the patient, who also may complain of dizziness. In complete paralysis of one oculo-motor nerve the first thing that is observed, besides the disturbance in the movements of the eyes, is more or less drooping of the eyelid (ptosis). The affected eye does not move upward, downward, or inward. The pupil is dilated (mydriasis), and does not contract to light. Distinct vision for near objects is impossible, and accommodation is lost. In old oculo-motor paralysis the eye is turned outward, owing to the contracture of the unparalysed external rectus.

Paralysis of the abducens is characterised by inability to move the external rectus. The eye can no longer be moved outward beyond the median line, and in old paralysis of this kind the eye is drawn inwards (convergent strabismus), owing to the contraction of the internal rectus.

The symptoms of paralysis of the *trochlear* nerve, influencing the superior oblique muscle, are difficult to explain, and are not of much practical importance.

Rheumatic paralysis is acute in its onset, affects the abducens most frequently, is associated with pain in the eye and head, and tends to recovery, as a rule, in a few weeks. The diphtheritic ocular paralysis sets in about ten days after the termination of the disease, and affects the muscles of accommodation, so that near objects are seen indistinctly. The prognosis here is always favourable. The course and prognosis of the other forms depend upon the morbid processes which underlie them.

Treatment.—(1) Mercurial inunction and iodide of potassium in syphilitic cases. (2) In other cases strychnine subcutaneously in the vicinity of the eye, or a weak galvanic treatment. The acute pain associated with the rheumatic paralysis must, however, have abated before using either of these remedies.

PARALYSIS OF THE FIFTH NERVE (trigeminus).—The principal symptom here is anæsthesia of the face. The anæsthesia may in some cases be traced to the median line of the forehead, nose, and mouth, and hence the patient's attention may be for the first time directed to his ailment when he puts a cup of tea to his lips and only feels half of it. There may be paralysis or spasms of the muscles of mastication. The sense of smell is not lost, but the sense of taste is found absent in the anterior portion of the tongue. A serious and important change also may ensue by foreign bodies lodging in the eye, which set up inflammation, resulting in sloughing of the cornea.

Etiology.—The great majority of cases of paralysis of the fifth nerve are caused by complete destruction of the trunk or of its ganglion, which results from caries or necrosis of bones, syphilitic disease of bones or membranes, cancerous growths or aneurysm of the carotid artery.

Treatment. — The chief remedy is the electric current, treating the anæsthetic portion of the skin with the faradic current, by the employment of the wire brush; or by the galvanic current, stroking the skin slowly with the cathode for three or four minutes. In addition to electricity liniments may be used, as lin. chloroformi, and cold or hot local douches. To protect the eye from external injuries a bandage should be carefully applied.

Paralysis of the Olfactory Nerves.—In this condition there is loss of the sense of smell—anosmia. It may arise from blows on the head, the part struck being generally, if not always, the occiput, or without any central affection of the olfactory nerves it may be due to thickening of the Schneiderian membrane from chronic catarrh. Sometimes this condition is observed in locomotor ataxy and hysteria.

The centres of smell and taste, according to Ferrier, are under the surfaces of the temporo-sphenoidal lobes; and when injured there is inability to perceive odours. When the lesion arises from central causes, it is associated with loss of taste, so that while a patient so afflicted is able to recognise bitter and sweet, sour and salt tastes, yet in all other respects his sense of taste appears to be extinguished. "He cannot tell one kind of meat from another; boiled apples, boiled onions, boiled turnips, all appear the same to him. All kinds of wine seem to have lost their flavour, tasting more like sour or sweetish water, except that they are more or less rough to the palate."

DISEASES OF SPINAL NERVES

The lesions of the spinal nerve trunks are mostly injuries from pressure, wounds, fracture, and dislocation in the lower trunks: from new growths, aneurysms, and abscesses in the proximal portions near the spinal column. Thus the posterior thoracic nerve, the circumflex nerve, the median nerve, and the ulnar nerve may be affected, and if so the muscles supplied by these nerves will exhibit characteristic paralysis. The fibres of the *phrenic* nerve may also be injured by wounds in the neck, or by pressure of tumours in the neck and thorax. It is also sometimes involved in diphtheritic and alcoholic paralysis. The characteristic symptom of a bilateral lesion is paralysis of the diaphragm, and the chief danger of this diaphragmatic paralysis is the accumulation of mucus in the chest; a full inspiration is impossible, and so coughing becomes difficult. The outlook is usually serious, especially if the paralysis follows diphtheria. It is not however always fatal; after lasting some days or weeks gradual recovery may take place. The *musculo-spiral nerve* from its exposed position is especially liable to injury from blows or fracture of the arm, or to be affected by pressure of the body upon the arm when a person is sleeping on a bench or on the ground, or from hanging the arm over the back of a chair during sleep, or by the use of a crutch. The most characteristic feature of the paralysis is the wrist-drop, and the inability to extend the first phalanges of the fingers and thumb. The sensations may be impaired or there may be marked tingling. The duration and course of the affection are very variable. The pressure palsies may disappear in a few days, and recovery is the rule even when the affection lasts for some weeks.

Sciatica.—This affection, formerly considered neuralgic, is now justly regarded as a form of neuritis, and the evidence that the disease is a neuritis and not a neuralgia is, according to Gowers, threefold. 1st, The conditions under which the disease occurs are very different from those that attend unquestionable neuralgia in other situations. 2nd, The neuritic nature of the affection is clearly indicated by the facts of pathological anatomy, scanty though these are. 3rd, The symptoms in severe cases are proof of the existence of neuritis, the wasting of the muscles and the anæsthesia preclude any other explanation.

Causes.—Sciatica is far more frequent in males than females between the ages of forty and fifty. Two constitutional conditions, gout and rheumatism, are potent factors in the production of sciatica, and the exciting causes are exposure to cold, muscular over-exertion, rectal and other tumours, usually by pressure on the sacral plexus.

Symptoms.—The chief symptom is pain. The onset is as a rule gradual; there is only slight pain in the back of the thigh, particularly in certain positions and after exertion. Soon the pain becomes more intense, and instead of being limited to the upper portion of the nerve extends down the thigh, reaching the foot and radiating over the entire distribution of the nerve. The pain may be dull or acute, often burning in character and worse at night. The most sensitive points are usually at the notch or middle of the thigh, and on pressure these are exceedingly painful. Abnormal sensations—tingling and formication—are often felt in the area of distribution of the nerve, and in severe cases there may be irregular spots of anæsthesia on the back of the thigh, on the leg or the foot. In protracted cases there is wasting of the muscles, chiefly of the calf muscles, but the reaction of degeneration can seldom be obtained.

The duration and course are extremely variable. It may last for weeks, or months, or even for a year. The disease is prone to relapse and still more prone to recur after recovery.

Treatment.—In all cases rest to the limb is essential. In the acute stage of severe cases hot linseed-meal poultices should be applied along the course of the nerve. Counter-irritation is of great value; a series of mustard plasters or small blisters should be applied over the seats of pain, and if under their influence the pain changes its seat, it should be chased from one painful spot to another until it disappears. If the pain be very severe it is necessary to use hypodermic injections of cocaine or morphine. It is best to use cocaine first and to inject it pretty deeply at the seat of pain but never into a nerve. One-twelfth of a grain may be first used, increased rapidly to a third or half a grain. If cocaine fails and the pain becomes unbearable, morphine may be injected over the inflamed part of the nerve, but its use should be withheld as long as possible. A sedative liniment of opium, chloroform, and belladonna (F. 57*h*) often affords great relief. In obstinate and protracted cases the Turkish bath on alternate days is of unquestioned efficacy. It should be followed by hot and cold douches played alternately over the course of the nerve, and by massage. The induced current for half an hour daily is sometimes beneficial. Acute attacks of a rheumatic origin may yield to full doses of salicylate of sodium; or if of a gouty nature, to colchicum and saline aperients. In chronic cases, when first seen, full doses of iodide of potassium 20 to 120 grains in the day should be tried; if no benefit be derived in four days it should be stopped, and a mixture given of iodide of sodium, salicylate of sodium, and phenazonum (F. 5*a*) or salacetol (F. 7*a*).

MINERAL SPAS.—Great benefit is obtained from the use of the baths at Buxton, Bath, Droitwich, and Harrogate in England; and Aix-les-Bains, Ischl, Teplitz, Wiesbaden on the Continent.

DISEASES OF THE SPINAL CORD

AFFECTIONS OF THE MEMBRANES

Inflammation of the membranes in meningitis may be external or internal. In EXTERNAL MENINGITIS the dura mater is involved, and this is often termed "Pachymeningitis externa." It commonly results from spinal caries. The inflammatory exudate is characterised by its purulent character, which may assume a dense consistence and cause symptoms of pressure on the cord. Thus pachymeningitis externa is usually a somewhat chronic affection, and it usually involves several vertebræ. The symptoms are pain in the back, often radiating, and the features of compression paraplegia.

INTERNAL MENINGITIS may be acute or chronic. It has its seat in the pia mater and arachnoid, and often exists with cerebral meningitis in the affection previously described as "epidemic meningitis" or "cerebro-spinal fever" (p. 73). An inflammatory exudation of a tenacious yellow character is deposited on the pia mater and arachnoid, filling up the meshes of the latter. The nerve-roots are involved in this exudation, and often the cord itself is invaded. Tuberculosis is not infrequently present in the form of gray granulations. This is probably the most common form met with in practice. Meningitis is also found secondary to certain infectious diseases, small-pox, scarlet fever, typhoid fever, pneumonia; and also from exposure to cold or to surgical procedures, as puncture of a spina bifida.

Symptoms.—Rigors, malaise, and pain in the back with rise of temperature generally usher in this affection. Violent pains are soon complained of on both sides of the body, whilst the pain in the back persists. Tremor or spasm of the muscles and hyperæsthesia are usually present. Later paralytic symptoms appear.

If the inflammation attacks the cervical region there is dyspnœa, and if the inflammation extends to the brain there is vomiting, headache, delirium, and contraction or dilatation of one or both pupils. Bed-sores are frequent.

Prognosis.—Complete recovery is rare, but partial recovery, with some amount of atrophy or incurable paralysis, sometimes occurs. In a very large percentage of cases a fatal issue results in the course of a few weeks. If there be a continually rising temperature—to 105° or upwards—the prognosis is bad.

Treatment.—This essentially consists in easing pain by opium or morphine. When these remedies do not agree with the patient, cannabis indica should be tried, or bromide of potassium. The affected region should be blistered or painted with tincture of iodine. Suitable feeding and careful nursing are requisite, and the position of the patient should be either on his side, or if possible on his face.

Hæmorrhage into the Spinal Membranes (*Hœmatorrhachis*).—This is a very rare occurrence. It arises from injuries, aneurysms, or during infectious diseases. The extravasation may occur either outside the dura or into the sub-dural space. In either case, the effusion may cause compression of and damage to the cord. As a rule the onset in non-traumatic cases is sudden, with sharp pain in the back, symptoms of irritation in the course of the nerves, such as muscular spasms, rigidity, hyperæsthesia, paralysis. The spasms precede paralysis, which is also less complete than when hæmorrhage into the cord occurs. The affection is serious, often fatal, but yet recovery is more frequent than from intra-medullary hæmorrhage.

Treatment.—This must be conducted in the same way as that of intra-medullary hæmorrhage.

AFFECTIONS OF THE BLOOD-VESSELS

(*a*) Congestion and Anæmia.—We know little anatomically of congestion and anæmia of the blood-vessels of the cord, and we know less clinically, for there are no features characteristic of them.

(*b*) Embolism, Thrombosis, Endarteritis.—Embolism in the spinal arteries rarely occurs, but thrombosis of the smaller arteries in connection with endarteritis plays an important part in many of the acute and chronic affections of the cord. *Endarteritis* is seen in two forms: (*a*) nodular, associated with syphilis; (*b*) obliterans, involving chiefly the medium and larger-sized arteries.

Hæmorrhage into the Spinal Cord, etc.—As a primary affection this is very rare, as in most cases hæmorrhages into the cord are a sequel of inflammation. It may occur at any age, and in both sexes, but it is most frequent in males. It is chiefly caused by injury, causing concussion of the spine, as in falling off a bicycle. Other etiological factors are great muscular strain, exposure, alcoholism, and sexual excesses. Examination of the affected area reveals the presence of minute or punctate extravasations of blood which may form small cavities in the substance of the cord.

Symptoms.—The onset is quite sudden. There is motor and sensory paralysis up to the seat of the lesion, pain in the back or legs, and incontinence of urine. Trophic changes occur commonly in the skin. The condition may rapidly prove fatal, or the symptoms may pass into a chronic stage with slow improvement.

Treatment.—For the hæmorrhage little can be done, but to prevent a recurrence ergotin should be injected. Afterwards we have to treat the sequelæ, by trying to prevent bed-sores and cystitis. If the first weeks pass without serious relapses, iodide of potassium should be given, with lukewarm or brine baths, and the scientific application of electricity employed.

ACUTE AFFECTIONS OF THE SPINAL CORD

MYELITIS.—Inflammation of the spinal cord is a common lesion. The mode of onset indicates the character of the morbid process. Acute myelitis is that form in which the symptoms indicating inflammation of the cord come on *rapidly* and reach a considerable height in a short time; when a longer time, say six weeks, elapses before the symptoms reach a considerable degree of intensity, the MYELITIS is termed CHRONIC.

ACUTE MYELITIS.—When an extensive area of the cord is inflamed, the myelitis is said to be *diffuse;* when the whole thickness of the cord in a small vertical extent is involved, the myelitis is said to be *transverse*, and as this form is the most common, a description of it will now be given.

Etiology.—Males suffer more frequently than females. It is met with (*a*) as an independent affection following on an exposure to cold or over-exertion; (*b*) as a result of injuries to the cord, lacerations, bruises, punctured wounds; (*c*) occasionally it is a sequela of infectious disease, or depends on syphilitic gummata, or it may appear earlier, within eighteen months of the primary affection; (*d*) diseases of the bones of the spine.

Pathology.—The essential change in acute myelitis is softening. At first the tissue, both white and gray, is hyperæmic and swollen. Extravasation of blood occurs in most cases, which, however, becomes absorbed, leaving a fatty residue and increase of the neuroglia. Numbers of leucocytes are also deposited in the damaged areas. Ascending and descending degeneration may proceed from the softened parts. A process of induration finally results, but in favourable cases some of the damaged nerve-fibres may regain functional capability to a certain extent.

Symptoms.—The mode of commencement is variable. Sometimes it is preceded by general weakness and fever; dragging pains in the limbs; sometimes it is ushered in by spinal symptoms, consisting of disturbances of sensation, and motor signs of irritation. Very soon—indeed, after a few hours, or the next day—appear characteristic paralytic symptoms in the form of motor and subsequently sensory paralysis. In almost all the severe cases vaso-motor paralysis sets in, and is accompanied by cystitis and extensive bed-sores. The subsequent course of the disease varies. It may be rapidly or more slowly and less violently fatal; or it may develop into chronic myelitis or incomplete recovery; or finally, and unhappily rarely, complete recovery takes place with protracted convalescence. In acute transverse myelitis there is paralysis of the lower limbs and of the bladder and rectum (at first retention, then incontinence). The legs may show spastic rigidity with increased reflexes. The muscles are not much wasted, and do not show reaction of degeneration. Sensation is less disturbed. At first there may be girdle sensation and hyperæsthesia at the level of the myelitis. In the rare form of *diffuse central myelitis* there is usually rapid loss of power, of sensation, and of reflex action, considerable elevation of temperature, 106° or 107°, speedy trophic disturbance, and often death at the end of two or three days.

Treatment.—The patient must be carefully nursed, and every precaution taken to prevent the formation of bed-sores and cystitis. The skin must be frequently bathed. For retention the catheter must be regularly used; incontinence may be met by a properly fitting urinal. During the acute stages drugs are not of much use. In suspected syphilitic cases active mercurial treatment, followed by potassium iodide, may be tried. Local treatment by ice-bag or hot poultices may be used to allay spinal irritation. In strong subjects the spine may be cupped or leeches applied. In the acute stages electricity should not be used, but in the chronic stages it may be used with stimulating diet and massage, thermal and brine baths, and nerve tonics, *e.g.* silver.

ACUTE ANTERIOR POLIOMYELITIS (*Infantile Paralysis, Acute Atrophic Paralysis*).—This form of paralysis occurs six times more often in the first ten years than in the remainder of life, and hence up to late years it was designated Infantile Paralysis; but it is now known that adults, males more than females, may be occasionally affected. While its causes are very obscure, it has been clearly shown that the lesion is an acute inflammatory affection of the anterior cornua of the cord, which is followed by sclerotic changes, with destruction of the ganglion cells, and degeneration of the motor nerve fibres.

Symptoms.—The onset is sudden and attended with feverishness, occasionally convulsions, and pains, localised or general. The feverishness and pains may last for some days before paralysis is observed, which may be limited to a single group of muscles in one limb; or it may affect an arm and leg, or all four limbs at once. The affected muscles rapidly atrophy, lose bulk and become flaccid; the faradic current excites no contraction, and in severe cases galvanic irritability, though at first increased, ultimately disappears. The reflexes are quite lost, sensation is never seriously affected, and the bladder and rectum are not involved. In adults, but rarely in children, the paralysis having arrived at this stage gradually passes off. More frequently with children the parts affected become completely paralysed, their temperature falls, and permanent deformities take place. The disease is rarely if ever fatal, but death may occur from other causes, as pneumonia, or the exanthems.

Treatment.—In the early stage of the paralysis ice-bags may be applied to the spine, and ergotin given in doses of $\frac{1}{6}$ to $\frac{1}{3}$ grain for children, and 1 or 2 grains for adults, twice daily. But after a month or so this medicine should be discontinued, and local treatment adopted. Massage is useful in promoting the circulation of the limb, and every effort should be made by passive movements and position to prevent deformities. The use of the induced current should be persevered in so long as muscular contractility continues. "If this is lost to the induced current, the case will be difficult and the treatment protracted; if the primary current is also powerless, a cure is impossible" (Hammond).

LANDRY'S PARALYSIS (*Paralysis Ascendens Acuta*).—This disease was first definitely described by Landry in 1859. The paralysis commences in the lower limbs and ascends rapidly till the medulla is involved. In a few cases changes have been found in the nerve-roots, and the disease is now generally held to be closely related to the toxic polyneurites.

Etiology.—The causes are obscure. Exposure to cold and syphilis have been noted as exciting causes, and the disease has also occurred during convalescence from an acute febrile malady. The time of occurrence is between twenty and forty, and the male sex is attacked more frequently than the female.

Symptoms.—Weariness of the limbs and numbness in the hands and feet may be the first direct evidence of the disease. Afterwards, at a short interval, there is extreme weakness of the lower extremities followed by actual paralysis. This paralysis is seen first in the distant portions of the limbs and gradually approaches the trunk, so that in the course of a few days paralysis of the lower extremities is complete.

The trunk muscles are next and soon implicated. The patient is unable to sit up. Constipation exists, and defæcation is interfered with through weakening of the abdominal muscles. Respiration is also affected; next the upper extremities are involved, paralysis commencing at the distant extremities and extending until the whole body becomes paralysed.

THOUGH THE MUSCLES ARE LAX THERE IS NO ATROPHY;

AND THE ELECTRICAL REACTION OF NERVES AND MUSCLES CONTINUES PERFECTLY NORMAL AS A RULE.

Sensibility is not impaired, and there is no tendency to the formation of bed-sores, neither is there any increase of temperature.

In one-third of the cases noted the disease may be arrested, recovery taking place and power being shown first in the arms, second in the trunk, third in the lower extremities. In two-thirds of the cases the disease progresses, and ultimately the patient dies of asphyxia. Death may occur in three or four days, or not until as many weeks have elapsed.

Diagnosis.—The absence of fever, and its involving the medulla and producing a rapidly fatal issue, distinguish this disease from acute spinal paralysis. From chronic spinal paralysis it may be diagnosed by the absence of atrophy of the muscles, and by their electrical condition not being lost.

Treatment.—Treatment, in the absence of pathological lesions, can only be empirical. Gentle shampooing of the limbs has been recommended, together with brief daily applications of weak faradic currents to the affected muscles. A combination of iron and arsenic has been suggested, and the cautious administration of strychnine.

CHRONIC AFFECTIONS OR DEGENERATIONS OF THE SPINAL CORD

SECONDARY DEGENERATIONS.—In diseases which are either developed in its own substance or in some portion lying outside the same, the spinal cord in a portion of its tracts is secondarily involved in disease.

These changes in the spinal cord which are thus caused are designated *secondary* degenerations. They act quite differently according to the seat of the lesions which cause them. Several groups are distinguished.

(a) *Secondary degeneration of the spinal cord in diseases of the brain.*—This is of course descending in its progress. This degeneration is called forth by lesions, such as effusions of blood, foci of softening, scleroses, and chronic inflammations, which to any considerable extent involve the pons, the peduncles, the optic thalamus, and corpus striatum. After the lesion has lasted some time descending degeneration of the pyramidal tracts takes place, and in the spinal cord this is situated on the opposite side from the brain lesion in the lateral columns (therefore crossed) and on the same side with the brain lesion in the anterior columns.

(b) *Secondary degeneration of the spinal cord in diseases of the cord itself.*—If the disease involves the entire transverse diameter, or at least the greater portion of it, as it often does in all severe diseases of the cord, *ascending* as well as *descending* degeneration will be found as soon as the affection has lasted a certain length of time—four, six, or eight weeks. *Ascending degeneration* extends to the inner halves of the posterior columns (Goll's columns) or to a narrow zone of the outer periphery of the antero-lateral columns (the direct cerebellar tract of the lateral column).

Descending degeneration in affections of the spinal cord extends almost exclusively in the pyramidal tracts.

The ascending as well as the descending degeneration in the severe diseases of the cord is generally *bilateral*, but in lesions which only affect a portion of the transverse section of the cord, as in some *traumatic unilateral lesions*, the ascending and descending degeneration is confined to the *side* of the injury.

(c) *Secondary degeneration of the spinal cord in disease of the peripheral nerves.*—This condition is rare and only exists in lesions of the posterior roots. Lesions of the motor roots or lesions (section, crushing, etc.) of the peripheral nerve-trunks are *not* followed by any secondary degeneration in the cord.

The cause of secondary degenerations.—Secondary degeneration occurs *as soon as definite conduction tracts are separated* from their *trophic* centres, *i.e.*, their *centres of nutrition.*

Pathological Anatomy.—In the earlier stages of the process alterations in the nerve-fibres are met with principally and almost exclusively, but in the later stages of the process the alterations are in no way to be distinguished from the ordinary gray degeneration in tabes dorsalis.

Diagnosis.—Secondary *ascending* degeneration is simply not to be recognised by any clinical manifestations; but in the case of a well-established diagnosis of a definitely localised affection of the spinal cord (myelitis from compression trauma, etc.), it is merely to be expected, with some certainty, as a necessary result of the same. In secondary *descending* degeneration the only sign which points to it with some probability is the occurrence of late contractures. When, therefore, in the course of a hemiplegia or paraplegia, muscular tensions and contractures set in after some weeks, we may infer the existence of descending degeneration of the pyramidal tracts.

CHRONIC MYELITIS.—Strictly speaking, this term should include only cases of myelitis which are slowly developed and which run a tedious lingering course without fever. Yet it is also commonly applied to unrecovered cases, that have begun as acute myelitis.

Chronic myelitis, like the acute form, may be diffuse or transverse. Syphilis is without doubt a not uncommon antecedent; it arises also from cold, repeated exposure, and occasionally from alcoholic excess or chronic lead poisoning.

The inflammatory patches of the cord microscopically show interstitial inflammation. The formation of new connective tissue is accompanied by degeneration and atrophy of the nerve-fibres and ganglion cells. The new connective tissue consists of branching neuroglia cells, surrounded by a more or less dense network of fine fibrillæ, many, if not most, of which seem to be branches of the neuroglia cells. The arteries are thickened, and around them the new tissue is especially abundant.

Symptoms.—The clinical history is essentially the same as in the acute form of the disease, with the difference that there is a slow development of the disease. Its duration is always protracted and may last for years.

Treatment.—In the treatment of chronic myelitis we should remember that recovery is rare, and in the most hopeful cases slow. Energetic and active treatment leads to disappointment and failure. Chief reliance must be placed in the three therapeutic agencies: (1) thermal brine baths (Rehme, Nauheim); (2) rationally conducted cold-water cure, as simple rubbing with wet cloths, sponging the back, hip-baths, local compresses to the back left on till they become warm; (3) careful electrical treatment, with a current not too strong nor long applied at one sitting, continued for months with occasional brief pauses. The best internal remedies are ergot and belladonna.

Dietetics and Mode of Life.—The diet should be similar to that recommended in acute myelitis. The bowels should be kept open by aperient enemata. Exercise should be taken, if the patient be able to move about, in the open air, but should always be stopped when there is the slightest sensation of *fatigue*. A sojourn in summer at a high altitude is useful, and in winter at a place of an equable temperature, as at the Riviera, Algiers, etc. Paraplegic patients should have fresh air, and for this purpose a wheel-chair may be used with advantage.

PRIMARY SPASTIC PARAPLEGIA (*Primary Lateral Sclerosis*).—Erb, in 1875, and soon after, Charcot, drew attention to this peculiar form of paraplegia, and both agreed in assuming it to be a primary symmetrical sclerosis of the lateral columns. Most cases examined post-mortem show involvement of other parts also, but Dreschfeld reported an almost pure case.

The *symptoms* are very distinctive, as the following history of a case which came under my observation clearly brings out. A married woman, aged thirty-six, after a prolonged labour gave birth to a living child. Three months afterwards she complained of feeling tired, and of stiffness in the legs. This stiffness was felt most in the morning. Walking power after six months was impaired, and subsequently the spastic gait was marked. The legs seemed to drag behind the patient, and in walking the toes caught against the ground, whilst the body was slightly bent forward. The reflexes were greatly increased. As the disease advanced, walking became impossible, and she was permanently bedridden, lying on her back. The legs then could not be separated at the knees, and the heels were drawn up so as to touch the buttocks. Clonic spasms followed attempts at separation of the limbs. There was no loss of sensibility, no wasting of the muscles, no loss of control over the bladder or the rectum, no impairment of her mental faculties.

Diagnosis.—In this case the diagnosis was easy, but in certain cases in the early stage it may be mistaken for hysterical paraplegia; but in the latter, though there be an excess of knee-jerk, there certainly is no *true ankle-clonus.*

Prognosis.—The disease runs a very slow course, and the chance of recovery and the danger to life are both small. There is some prospect of arrest, and even of slight improvement, if the disease has not reached an advanced stage; but when the spastic stage is well developed and has lasted some time it is very rare for marked improvement to occur.

Treatment.—Medicinal treatment, by strychnine, ergot, or arsenic, does more harm than good, yet extract of physostigmine appears in cases recorded to have caused some improvement. Warm baths for an hour daily render the limbs more relaxed and flexible, and afterwards the muscles should be rubbed in an upward direction. More benefit, however, will accrue from the rubbing after a Turkish bath.

LOCOMOTOR ATAXY (*Synonym*, Tabes Dorsalis) is a peculiar affection characterised by disturbed co-ordination of muscular movements, and various sensory and trophic changes.

Etiology.—In 89 per cent of Erb's cases there was a history of syphilis. Other factors are undue exposure to cold and damp, venereal excess, mental worry, and, in a few cases, trauma.

It is especially a disease of males, and is rarely met with in youth, usually occurring between the ages of thirty and fifty years.

Symptoms.—The onset is insidious. The first suspicion of there being anything wrong is frequently awakened by an inability to run, through a feeling of the legs being too heavy. This is followed by fatigue after any exertion, and by increased micturition. The desire for sexual intercourse is at this stage of the disease increased. Dr. Althaus mentions as one of the earliest symptoms the inability to walk backwards. In most cases sudden sharp pains shoot down from the legs (lightning pain). The disease progresses slowly, and a considerable time may elapse ere the characteristic straddling gait is developed, the foot being lifted high and the heel planted down first. Usually there is diminished tactile and muscular sensibility of the lower extremities, with paræsthesiæ. Another sensory symptom is a sense of constriction round the waist, the so-called "girdle sensation." A highly characteristic symptom is *loss of the knee-jerk*. Important visceral symptoms are often developed, termed "crises." The chief of these consists of severe gastric irritation, characterised by pain and excessive vomiting. These attacks are termed "gastric crises." In like manner *intestinal*, *nephritic*, and *bronchial* crises may supervene. Electro-muscular contractility remains intact, and there is neither palsy nor wasting of the muscles, but vaso-motor and trophic disturbances are not uncommon. Transient œdema of the limbs, herpes, perforating ulcer of the foot, and destructive changes in the joints are the chief of these. Incomplete emptying of the bladder or incontinence is common, and cystitis may be set up.

Eye symptoms are nearly always observed in cases of locomotor ataxy, and may be summarised as—

1*st*, Insensibility of the pupil to light, while it acts with accommodation—Argyll-Robertson's phenomenon.

2*nd*, Frequently there is atrophy of the optic nerve.

As the disease progresses it does not stop at the legs, but creeps upwards. Arms, hands, and fingers are involved. The coat cannot be buttoned, the pin put into the cravat, nor the spoon carried to the mouth. The urine is passed involuntarily in bed, and now the sexual power and appetite are diminished. Thus the patient may remain for years. Ultimately, the lower extremities become thinner, emaciation attacks the whole body, and death results from general weakness, phthisis, or other intercurrent disease.

Pathology.—The lesions are in the dorsal columns and posterior roots; the ganglia and peripheral nerves may be affected. The morbid change consists of atrophy and disintegration of the nerve-fibres with hypertrophy of the connective tissue. Oil-globules surround many of the blood-vessels. The pathological change seems to travel from the centre to the periphery, from the spinal cord to the posterior roots. In the cerebral nerves an opposite direction is assumed, centripetal instead of centrifugal.

Treatment.—In cases with a distinct history of recent syphilis inunction of mercury with large doses of iodide of potassium should be tried; hydropathy in various forms as prolonged warm baths, mud, sulphur, carbonic acid. In other cases, where the cause is obscure, it is advisable to use simple wet rubbings with water (beginning with 77° F. and going down to 68°), and half baths about 86° to 70° F. with simultaneous sprinkling and washing of the back. Associate these with a careful and prolonged use of electricity by means of the constant current, and endeavour to secure the action of the single poles upon the entire extent of the cord. Thus, place both poles on the vertebral column, one at the nape of the neck, the other at the lumbar region. Then one pole, say the lower, being fixed, the other may be moved quite slowly down over the back and thus brought in contact with the greater part of the cord; and likewise the upper being fixed, the lower may be gradually carried over the major part of the cord. The application should not exceed three to six minutes daily, and a strong current should be positively avoided. The treatment should be persevered with for months, and should only be discontinued if the patient feels more tired and weak after each application, if his condition as a whole grows gradually worse, if the pains increase, or if sleeplessness sets in.

In more advanced cases, nitrate of silver has proved beneficial, 1 to 1½ grains being given in divided doses in the course of a day, and the remedy may be continued until 120 grains have been used. Bromide of potassium in some instances relieves the pain, while strychnine is decidedly objectionable, and the use of belladonna and ergot has not been attended with much success. Treatment by suspension is no cure for tabes, but it relieves certain symptoms, chiefly those of a subjective character, as pain and other sensory symptoms, while the more purely physical signs of the disease, as the Argyll-Robertson pupil and the lost patellar reflex, remain unchanged. In more advanced and completely developed cases it is better to refrain from all useless attempts at any curative treatment, and simply attend to symptomatic indications, as relieving the constipation by enemata or appropriate diet, assuaging the lancinating pains by antipyrin or by subcutaneous injections of morphine, and seeking to secure as comfortable a life as may be for the victim of an incurable disease. Fraenkel has introduced a method of re-educating the muscles to perform co-ordinated movements which seems to be of considerable value in relieving the ataxia.

Ataxic Paraplegia. — This name is applied by Dr. Gowers to a disease which presents a combination of the symptoms of paraplegia and ataxy, and consists in combined disease of the posterior and lateral columns.

Etiology.—The disease is most common in middle-aged males. It is not associated with a history of syphilis, and its cause is obscure.

Symptoms and Course.—There is a slow and simultaneous development of weakness and incoördination. The patient feels tired and his gait is distinctly unsteady; dull pain is experienced at the sacral region, but lightning pains are absent. The knee-jerk is increased and ankle-clonus can be obtained. Sensation is mostly unimpaired and eye symptoms are not present. As the disease progresses the muscular power becomes more and more impaired, usually without much increase in the incoördination, which sinks into the background as the paralysis increases. Stiffness and rigidity develop, so that the resemblance to spastic paraplegia becomes very marked. Hence it has been termed by Dana *Spastic Ataxia.* The disease has little tendency to cause death; the chief danger to life being kidney disease and bed-sores.

Diagnosis and Prognosis. — The absence of ocular and sensory symptoms, the combination of marked incoördination with retention of the reflexes and more or less spasm, distinguish it from locomotor ataxy or spastic paraplegia. The *prognosis* is unfavourable.

Treatment must be similar to that of the two allied diseases, for there are no symptoms peculiar to ataxic paraplegia that require special treatment.

HEREDITARY ATAXY (Friedreich's).—This is a hereditary form of ataxia, almost always occurring among females in the same family, somewhere between twelve and eighteen years of age. It commences with ataxia of the legs, which soon passes into the arms. The tendon reflexes may disappear, but the sensibility of the skin and muscles is unimpaired, and the functions of the bladder are normal until a late period of the disease. Vision is unaffected, but there is disturbance of co-ordination of the lips and tongue necessary for normal speech. The course of the disease is protracted over many years. There is no chance of recovery, and the final issue is complete paralysis, contractures, and atrophy of the paralysed muscles.

SYRINGOMYELIA.—This lesion of the spinal cord consists in the formation of gliomatous or *glio-sarcomatous tissue* in the vicinity of the central canal, and its subsequent partial disintegration with the formation of one or more cavities within the substance of the cord. The tissue mentioned, which forms the basis of the lesion, probably originates from the layer of neuroglia which surrounds or extends away from the central canal. The cavities, which are filled with fluid, vary greatly in size, shape, and extent, and while usually situated in the central region of the cord, they may involve the anterior and posterior cornua, and invade the posterior columns. The lower cervical and upper dorsal regions are most frequently involved.

Symptoms.—This slowly developing disease appears as a rule about the fifteenth year, and may persist for fifteen or twenty years. It is not always detected during life, but cases recorded show progressive muscular atrophy affecting especially the upper extremities, with *loss* of sensation to pain, heat, and cold, and *retention* of tactile sensibility. The reflexes are increased and a spastic condition develops in the legs. Trophic disturbances are noted, such as swelling of the fingers, loss of the nails, bullæ and ulcers. The sphincters are uninvolved.

Compression of the Spinal Cord.—Compression of the cord generally excites inflammation and degeneration of the nerve elements—compression myelitis. Owing to inflammatory disturbance of the nerve-roots, pain is complained of in the course of the nerves implicated.

Motor Symptoms.—Contraction and atrophy of muscles are also seen. Below the lesion paralysis is developed with varying rapidity, and ankle-clonus is present.

Sensory Symptoms.—Numbness and tingling and often also pain are complained of in the lower limbs. In cases of spinal caries (Pott's disease) there is more or less angular curvature and the affected vertebræ are tender and swollen.

The pains, muscular atrophy and diminished electrical excitability are known as *root symptoms*, whilst the paralysis, exaggerated reflexes and sensory disturbances are spoken of as *cord symptoms.*

The issue of the affection is variable. Temporary improvement is common, and partial recovery is in many cases to be expected. Complete recovery is very rare. The more rapid the cord symptoms appear, the greater is the likelihood of improvement.

Treatment.—When caries is recognised early, rest and support may do much to prevent the onset of paraplegia. When paralysis has developed, rest and extension according to the Mitchell method has a remarkable curative effect, even in apparently desperate cases. The chief value of suspension is, as is now generally recognised, that it allows of the application of plastic support. The adjuvants for promoting recovery are good food, fresh air, cod-liver oil, and arsenic.

Unilateral Lesion of the Spinal Cord (*Brown-Séquard's Paralysis*).—This lesion rarely follows caries but is caused by tumours or stab-wounds. It is followed by a peculiar and definite palsy. Compression, here limited to one side, causes the motor palsy on the same side, with other symptoms; on the opposite side anæsthesia is found at the same level. The following table illustrates the distribution of symptoms in a hemi-lesion of the cord.

CORD

Zone of cutaneous hyperæsthesia. Zone of cutaneous anæsthesia.	Lesion.	
MOTOR PALSY Hyperæsthesia of the skin. Muscular sense impaired. Reflex action first lessened, then increased. Temperature raised.		MUSCULAR POWER NORMAL Loss of sensibility of skin. Muscular sense normal. Reflex action normal. Temperature same as that above lesion.

PROGRESSIVE MUSCULAR ATROPHY (*Synonym*, Amyotrophic Lateral Sclerosis).—This is a disease characterised by a slow wasting of the muscles, depending on progressive degeneration of the ganglion cells of the anterior cornua of the cord, accompanied by a similar degeneration of the motor nerve-fibres which arise from these cells.

Etiology.—It is chiefly a disease of adult life, developing after the thirtieth year, and more frequently attacks males than females. The cause of the disease is not determined. Some regard as possible factors, cold, exposure, mental distress, syphilis, or injury.

Morbid Anatomy.—The muscles affected during life are found after death to be reduced to small flabby bundles, in which fat and connective tissue outweigh the muscular tissue. In the spinal cord, especially the cervical portion, the anterior cornua are very small; the ganglion cells having largely disappeared, the few remaining are atrophied; fine fibrous tissue replaces the neuroglia; the anterior roots and the affected motor fibres in the peripheral nerves are also atrophied. There is also extensive degeneration of the pyramidal tracts, both anterior and lateral, and sometimes the degeneration extends upwards into the medulla and along the pyramidal tract into the convolutions. Thus bulbar paralysis is sometimes met with.

Symptoms.—As a rule the course of the disease is very slow. It begins most frequently in the upper extremities, its commencement primarily affecting the small muscles of the thumb, and causing *a flattening of the ball of the thumb.* Afterwards it attacks the muscles of the forearm on the external side, and in the upper arm the deltoid and then the biceps. The disease progresses slowly but steadily until every voluntary muscle of the body is involved, with the exception of the muscles of the eyeball and the levator palpebræ superioris. Years may, however, elapse before the general muscular atrophy is complete, and the arms may be perfectly useless while the patient can still walk without fatigue. The tendon reflex is absent. The sensibility of the skin and deeper parts remains untouched, and the functions of the sphincters of the bladder and rectum are normal. As the disease progresses the muscular region which receives its nervous supply from the medulla is also implicated, and the symptoms of progressive bulbar paralysis are added to those of progressive muscular atrophy. If so, then the speech becomes thick, swallowing is difficult, and the patient dies from paralysis of deglutition and respiration, or some intercurrent disease.

The above description applies to groups of cases where, with the atrophy and paralysis, the muscles are flaccid, hence the condition is termed ATONIC ATROPHY, but in other groups with the wasting, which, however, is not extreme, there is more or less spasm, and spastic paraplegia may be developed, a condition termed TONIC ATROPHY. In such the knee-reflex is exaggerated and there is ankle-clonus. Between these two groups conditions "may coexist in every degree and combination, showing universal atonic atrophy on the one hand and universal spastic paralysis without wasting on the other."

Prognosis.—The prognosis is unfavourable in both groups of this affection, but in the atonic type the disease extends over a longer period of years, ten or fifteen, than in the tonic type, when the duration is from one to three years.

Treatment.—Some improvement of a temporary kind follows on massage and electrical treatment, combined with nutritious food, exercise without strain, and freedom from mental worry. Strychnine hypodermically in doses of $\frac{1}{80}$ to $\frac{1}{60}$ grain has been recommended with arsenic internally.

Pseudo-Hypertrophic Muscular Paralysis.—This is a form of paralysis in which the ultimate fibres of the muscles atrophy and are replaced by interstitial fat and fibrous tissue, so that the muscles seem actually hypertrophied. The *false* muscular development begins frequently in early life before the child, usually a male, should walk. It commences in the gastrocnemii and the flexor muscles of the thigh, and also attacks the erectores spinæ. As the disease progresses other muscles suffer, particularly those of the trunk, upper limbs, and face, and in some instances the non-development of fat makes the condition appear to be simply one of atrophy. When the disease has advanced, the whole of the voluntary muscles are implicated in the degenerative process, and become more or less atrophied. The disease is usually inherited on the mother's side.

Pathology.—Though the muscles seem firm, hard, and increased in size *at first*, yet if a portion of the muscle is removed by the "emporte-pièce" of Duchenne, a microscopic examination shows that the muscle is atrophied, and that the increase is due to the interstitial development of fat and fibrous tissue. The disease is probably a primary disease of the muscular tissue. There are usually no definite changes in the nervous system.

Symptoms.—At an early stage of the disease, when the child is stripped the enlargement of the calves generally contrasts greatly with the emaciation of the upper half of the body. The belly appears swollen, but this is not actually the case, its unnatural prominence being due to the fact that the antero-posterior curvature of the vertebral column is much exaggerated, and that the shoulders are thrown back. The walking is waddling, as it were, on tiptoe, the heel not being placed on the ground. A child thus affected has not much muscular power, for he is easily knocked over; yet he can recover the erect posture with comparative ease from a sitting position. In the later stages of the disease walking is impossible, and the child lies still. The disease, on an average, lasts from five to six years, and death ensues from exhaustion or from intercurrent disease.

Treatment.—The prognosis is essentially unfavourable, and no medicine at present known seems to have any power to arrest its progress. In the early stage Duchenne recommends faradisation and shampooing.

Myotonia Congenita (Thomsen's Disease).—Thomsen, a Schleswig physician, in 1876 described this disease, which he called "tonic convulsions of the voluntary muscles." Now the name more appropriately given to it is "congenital myotonia." The disease appears to be congenital and hereditary, and males suffer more than females. The essential symptoms are:—Whenever a voluntary muscle has been inactive for a time, and is then made to contract, it falls into a state of more or less persistent contraction, which cannot be immediately relaxed. Mental excitement seems to exert an unfavourable influence, and quick and accurate movements are beyond the control of the will. The disease is permanent, and there is little constitutional disturbance.

The explanation of the symptoms given is difficult, but a physical examination reveals great development of the muscles, so that it deserves the appellation of "genuine muscular hypertrophy." From this fact it is probable that the cause of the disease lies in the muscle itself, and this idea is supported by the microscopic examination of minute particles of muscular tissue, which showed "marked hypertrophy of individual muscular fibres and an increase in the number of nuclei of the sarcolemma" (Erb).

DISEASES OF THE BRAIN

AFFECTIONS OF THE MENINGES

Of the three membranes that enclose the brain, only two are pathologically separable, since the arachnoid and pia mater always suffer together. The separate inflammation of the dura mater is termed "Pachymeningitis," and is much less common than the affection of the pia arachnoid, which is commonly meant when "meningitis" is spoken of. The affection of the soft membranes has been of late termed "Leptomeningitis" in more precise antithesis to pachymeningitis.

DISEASES OF THE DURA MATER.—(a) *Pachymeningitis Externa.*—External pachymeningitis is almost always secondary to injury or to adjacent disease. The disease is usually due to caries or necrosis of the bone, which may lead to a large collection of pus between the dura mater and the bone. The symptoms of the secondary inflammation are usually lost in those of its cause. They are not definitive.

(b) *Pachymeningitis Interna.*—Internal pachymeningitis is met with in two forms—(1) Purulent; (2) Hæmorrhagic. The most important of these is the latter, which has been long termed "Hæmatoma of the Dura Mater." Effusions of blood are found on the inner surface of the dura mater within the so-called arachnoid cavity. Virchow believed that the earliest change was inflammation of the dura mater (Pachymeningitis), and that the hæmorrhage was only secondary. But later investigations of Huguenin seem to show that it depends on an affection of the walls of the blood-vessels, which diminishes their power of resistance, and that hæmorrhage is the initial change. The hæmorrhage always takes place inside the mass or between its layers; if it breaks through the innermost layer, so that the blood flows into the arachnoid spaces, the result is known as "intermeningeal apoplexy." It has been found without attendant symptoms at the autopsy of typhoid fever, small-pox, in chronic cardiac and pulmonary diseases, but more especially is it common at post-mortem examinations of general paralysis of the insane, and of chronic alcoholism. It is a disease of advanced life, more common in males than females. The diagnosis is very difficult, and is only problematical, when in cases of chronic cerebral disease, as those mentioned, there is a sudden attack of the nature of apoplexy, with the abrupt appearance of symptoms of coma, unilateral convulsions, monoplegic paresis, contractions, and contracted pupils.

Treatment.—In a supposed case of hæmatoma ice should be applied to the head, purgatives administered, and local depletion by leeches on the temples or behind the ears.

Diseases of the Pia Mater.—Acute inflammation of the membranes of the brain is chiefly in two forms, one characterised by the presence of tubercles, *tubercular meningitis*, the other suppurative, *simple meningitis.*

Tubercular Meningitis (*Synonym*, Acute Hydrocephalus) is a disease not uncommon in children under five years. The ventricles are found distended with serum, and the convolutions are much flattened. This characteristic appearance in post-mortem examinations led to its being called "acute hydrocephalus," before it was understood that its essential causes were the tubercles. Gray miliary tubercles are formed at the base of the brain, and the presence of these excites inflammation of the membranes along the course of the middle meningeal artery and its branches. These tubercles may be so minute as to defy detection unless a microscopical examination is made; they may be so abundant as to form large granular masses; or they may blend into cheesy patches of considerable extent and thickness. They appear to originate in the perivascular lymphatic sheaths of the small cerebral arteries, and they invade and partially block up the channels. Hence, intense hyperæmia is caused in collateral vessels, and the pia mater at the base of the brain is very vascular. The disease always terminates fatally.

Symptoms.—Tubercular meningitis is preceded by signs of failing health for some weeks or months before the attack sets in, which it does generally with obstinate vomiting and intense pain in the head. The child screams, the belly is drawn in, and there is great intolerance of light and sound. The temperature varies from 101° to 103° F. This may be called the stage of excitement, which lasts from seven to fourteen days, and is succeeded by a stage of depression with a strong tendency to sleep. The child lies quietly on its back, its pupils are dilated, and it takes no notice of external objects. Occasionally there is a peculiar scream called the hydrocephalic cry. Respiration is irregular and sighing, pulse low, temperature subnormal, and bowels constipated. If the finger-nail be drawn quickly across the skin of the forehead, or abdomen, a red line comes out quickly and may persist for five minutes. This is called *Tache cérébrale* or *Tache meningitique.* This stage may last from two or three days to as many weeks, and is followed by a stage of paralysis, characterised by the temperature again rising above the normal, by frequent and possibly violent convulsions, heavy dull eyes, paralysis, and coma.

In accordance with the pathology of the disease advanced, it may, generally speaking, be stated that the first stage, that of excitement, depends on the implication of the pia mater at the base of the brain; the second stage, that of depression, on the development of the hydrocephalic effusion; the third stage, that of paralysis, on the gradual paralysis of the centres in the medulla oblongata. Convulsions, to a greater or less extent, may also be present during the whole course of the disease, and cannot be referred to any one stage. Tubercular meningitis in its later stages simulates no other disease, yet at first it may be mistaken for typhoid fever more readily than anything else.

TUBERCULAR MENINGITIS IN ADULTS.—Tubercular meningitis in adults may occur in cases of phthisis, but it may also be seen, fortunately not often, independent of that disease, commencing, as a rule, gradually and insidiously; sometimes, however, being ushered in by convulsions or by well-marked local paralysis, as of the facial nerve, or by hemiplegia. If it commences insidiously, it may be mistaken for typhoid fever; and if suddenly, with no paralytic symptoms, it may be ascribed to hysteria. The diagnosis in such cases is difficult, and in some instances can only be solved by time and the development of the disease. Important evidence, confirmatory or otherwise, may be obtained—(1) from heredity as to tubercular disease; (2) or disease of lungs, or of strumous affections of the bones or joints. Not infrequently the autopsy belies all forecasts, and teaches observers to be very guarded. Tubercular meningitis is one of the most fatal of all diseases, while diseases with which it may be confounded, as typhoid fever, mania, delirium tremens, or hysteria, as a rule tend to recovery. It is necessary to remember that comparatively seldom are there any marked prodromata in adults, and in this respect it notably differs from the same disease in children.

Treatment.—The treatment of tubercular meningitis, either in children or adults, is hopeless, for tubercles cannot be absorbed. In doubtful cases it is essential that the treatment should do no harm, and be purely expectant, until the particular disease in question has asserted itself. "Our effort should be to sustain life from hour to hour in the hope that the tide may turn" (Fagge).

Simple Meningitis (*Synonym*, Simple Idiopathic Cerebral Leptomeningitis).—The distinct names given to simple inflammation of the membranes of the brain, according as the convexity or the base is affected and according as the disease is associated with different causes, have much plausibility in theory, but they lead to confusion in the mind of the student. We will therefore attempt to describe the inflammation as a whole, and not with reference to a separate nomenclature.

Etiology.—The causes are many. Surgical injuries, extension of inflammation from chronic disease of the skull or first two cervical vertebræ or of the ear, suppuration of the eyeball, etc., may induce the inflammation; or it may be due to metastasis; it may be secondary to acute disease, as pyæmia, typhus fever, bad cases of pneumonia or pleurisy, or to syphilitic gumma, or it may arise from direct action of the sun's rays on the head, or from unknown causes.

Pathology.—If the inflammation has been very severe, we find on a post-mortem examination, after turning back the dura mater, that the convolutions of the brain are covered by green purulent material, which, in the majority of cases, is also present within the meshes of the pia mater. The investing membrane of the brain also will be greatly swollen, while in slighter cases this will be hardly apparent, only pus being found at limited sites. Sometimes the convolutions are softened, and when the pia mater is stripped off a ragged surface is exposed to view. The increased pressure which precedes death empties the vessels, and the ventricles may contain pus.

Symptoms.—The attack is sudden, attended with piercing headache, intolerable agony, vomiting, and extreme irritability to light and sound. The eyes are red, the pupils contracted, the face flushed, and the head hot. The temperature on the third day may reach 103° F., and then also delirium is marked. This may be considered a stage of irritation, and is followed by a stage of pressure, with spasms or convulsions or paralysis, involuntary passage of evacuations, and finally death by coma.

Duration.—In very severe cases death occurs in forty-eight hours or three days, or, in less intense cases, the disease may last for a week or more, and in rare instances terminates in recovery.

Treatment.—(1) Shave the scalp, and apply to it ice in a bladder; (2) leeches behind the ear, and cupping-glasses to the spine; (3) administer calomel, or rub in unguent. hydrarg. Wash out the mouth with a solution of chlorate of potassium to prevent the gums being affected. The treatment thus mentioned is for a case of a child or young person suffering from acute meningitis alone. In such cases the diagnosis is not doubtful. In an adult there might be a possibility of cerebral syphilis, but the treatment would be good in both affections. When it is secondary to other affections, as pyæmia, or where the diagnosis is not certain, iodide of potassium and small doses of perchloride of mercury should be tried.

AFFECTIONS OF THE BLOOD-VESSELS

Cerebral Anæmia.—*Etiology.*—This condition may be brought about by influences which act on the circulation of the brain alone; or it may be combined with a general anæmia, which affects the whole body. Again, the cerebral anæmia may affect the whole brain, or it may be limited to certain parts. The former condition is by far more common. Further, according as the anæmia is produced suddenly or gradually, so also do the clinical symptoms vary. With reference to the above statements we may allude to certain well-known circumstances connected with universal cerebral anæmia. In difficult labours, when finished, syncope sometimes occurs, by the rush of blood to the abdominal vessels, which are relieved from the pressure previously exerted on them. Similarly syncope may follow on the too rapid withdrawal of ascitic fluid when tapping is performed. Cerebral anæmia may arise from insufficient, feeble energy of the heart's action. Thus a person recovering from fever or diphtheria faints when the erect posture is assumed, because the heart's action is too feeble to send the necessary quantity of blood to the brain. Mental impressions may also produce fainting, by irritation of the vagus, causing a diminution of the supply of blood to the brain. Insufficient nourishment or prolonged lactation may also occasion cerebral anæmia.

Circumscribed partial cerebral anæmia may result from emboli or thrombi in the cranial vessels, or from local spasms, as in hemicrania or the *petit mal* of epilepsy.

Pathological Anatomy.—Anæmia of the brain is characterised anatomically by the pale colour of the organ. This is most evident in the gray substance, which is sometimes perfectly colourless, or has a dirty grayish appearance. Even in the white substance the surface looks whiter than normal, and there is an absence of the usual blood-points. A certain quantity of blood is found in the larger veins and sinuses, but in the membranes, as in the cerebral substance, the amount of blood is diminished.

Symptoms.—Giddiness, ringing and buzzing in the ears, paleness of the face, loss of consciousness, characterise the *slighter* forms of cerebral anæmia, as is exhibited by the faintness which sometimes attacks a medical student on his first sight of an operation. The *graver* forms may be due to sudden hæmorrhage, and may be attended with convulsions and coma. The state of the pupils is first one of contraction, next of dilatation, and finally they return to the normal condition if the issue is to be favourable. By many authorities death from sudden shock is ascribed to cerebral anæmia.

Treatment.—The line of treatment in cerebral anæmia, when it culminates in syncope, is to give the head a position relatively low to the rest of the body. This should always be attended to, but if the symptoms are severe and persistent, then irritation of the skin by sprinkling the face with cold water, or by the metallic electric brush, is necessary. The nerves of the mucous membrane of the nose should also be stimulated by the inhalation of the preparations of ammonium, or irritating enemata containing salt and water. If the pulse be very weak, cardiac stimulants should be employed, as alcohol or ether. As a last resort transfusion may be tried.

Cerebral Hyperæmia (*Synonym*, Cerebral Congestion).—This is an affection of decided importance, although doubts have been thrown on the possibility of its occurrence. It may be considered either active or passive.

Etiology.—In *acute* hyperæmia the chief cause exists in increased activity of the heart, as from hypertrophy; or when a normal heart is disturbed by emotion or excitement. Prolonged and increased mental activity is usually and justly regarded as a cause of cerebral hyperæmia, but in what manner it produces this there is no direct chain of evidence to show. It may also occur at the change of life in females, or in either sex through the stoppage of hæmorrhage from piles. *Passive* hyperæmia is observed in certain diseases of the lungs, as emphysema or large pleuritic effusions, or in diseases of the heart, as in the last stage of aortic or mitral incompetency; all forced expiratory movements with closed glottis, as severe coughing, violent screaming, long-continued blowing of wind instruments, powerful compression of the contents of the abdomen (such as occurs in efforts to empty constipated bowels, or during childbirth), are also recognised as being factors in this form of the affection.

Pathological Anatomy.—Certain post-mortem appearances, which may, however, be all or in part absent, are observed. In the active form, the capillaries and large blood-vessels of the brain and pia mater are increased in size; hence the blood-points are observed to be larger and more numerous than usual, while the pia mater has a red or rose-coloured appearance either in spots or throughout its whole extent. The gray matter is red or violet in hue, the choroid plexuses are enlarged, and the ventricles contain an excessive amount of fluid. In the passive form, when the quantity of venous blood is augmented, the veins generally are distended.

Symptoms.—In the *active* form there are pain, dizziness, and confusion of the intellect, which may last from half an hour to two or three days; sleeplessness, irritability of temper, and inability to do any mental work, with a sense of flying heat shooting over the head and neck, and redness of the face, are also prominent symptoms. In the *passive* form there is the same confusion of ideas, but with mental torpor instead of irritability, and drowsiness instead of sleeplessness. In the very severe forms there may be loss of consciousness, delirium, or convulsions. The slight forms are rarely dangerous in themselves, and may be recovered from under treatment. In the severe forms the prognosis is grave, and when death occurs it is due to coma. Cerebral hyperæmia or congestion is now not uncommon, in a more or less pronounced form, in mercantile and professional life.

Treatment.—The premonitory symptoms demand mental rest, with abstinence from work; and this rest may be aided by the liquid extract of ergot (x. to xxx. m. thrice daily), or bromide of potassium, by sleeping with the head high, and avoidance of alcoholic stimulants in every form. Exposure to the sun and variations of temperature are also to be shunned. Purgatives, and especially quickly acting purgatives, play an important part in treatment, especially in the very severe forms. Croton oil, salines, or irritating enemata may be employed (F. 24). Diuretics also do good, as acetate of potassium (F. 37). If the pulse be feeble, tincture of digitalis in small doses (4 to 5 minims thrice daily) is beneficial; or "Warburg's tincture," a special preparation of quinine, in teaspoonful doses before breakfast.

Dietetics and Climate.—Diet should be carefully attended to. Highly spiced dishes are countermanded—the plainer the fare the better the digestion. Dinner should consist of fish; white meat, as poultry, mutton, or veal; and bread or rice puddings. Alcoholic drinks and coffee should be avoided, but weak tea in moderate quantity may be taken. For the first four or five months after an attack, an absolutely quiet life is necessary, with cessation from work and mental annoyance. Afterwards a sea-voyage does good, or a change of climate, where the altitude is not high, as at Wildbad or Rippoldsau. Health resorts at high altitudes induce sleeplessness.

Cerebral Hæmorrhage, usually called "apoplexy," means extravasation of blood into the brain, or beneath its membranes, and is dependent on rupture of a cerebral artery. The most frequent site of the hæmorrhage is in the neighbourhood of the corpus striatum or optic thalamus. The blood poured forth, varying in quantity, dislodges part of the brain substance, and lies in the cavity thus produced. The extravasation in fatal cases is great, and not limited to the substance of one hemisphere, but extends either to the surface or into the ventricles. More definitely we may say that the chief seats of cerebral hæmorrhage are the large ganglia in the neighbourhood of the lateral ventricles. Hæmorrhage into the convolutions, the pons, the cerebellum, the crura cerebri, or the medulla is rare. In an autopsy of a case of cerebral hæmorrhage, we find that the size of the extravasation varies, being small, or occupying a large part of an entire hemisphere. The wall of the effusion is composed of torn cerebral tissue, and the mass itself contains the debris of the nervous elements seen in coagulated blood. When the case is recent the blood-clots are very dark in colour. But later on the colour changes to chocolate or yellow, and there is also a softening and swelling of the parts adjacent to the site of the hæmorrhage. If the patient survives, the effusion diminishes in size, and the final result is in many cases a cavity filled with serous fluid, enclosed in smooth walls. "The apoplectic cyst" may remain stationary, or, if the effusion has been small, the fluid is absorbed, and there is nothing left but what is termed "the apoplectic scar."

Pathology.—In the great majority of cases of cerebral hæmorrhage, where a fatal issue occurs, and when an autopsy is made, it is found that there is chronic renal disease of the contracted granular form. In almost every case of cerebral hæmorrhage there exist, moreover, "miliary aneurysms," which appear as little globular masses in the small intracranial vessels, and which are due to diffuse arteritis proceeding from without inwards. The disease of the vascular wall is not peculiar to the brain, but is identical with arterio-sclerosis or atheroma, which is diffused more or less over the body. Charcot and Bouchard, who first described these miliary aneurysms in 1868, thought differently, and said they were only pathognomonic of cerebral vascular disease, but later investigations do not bear out this supposition; for, as a rule, sex influences cerebral hæmorrhage, which is seen more often in men than in women. Age also has an important bearing; for cerebral hæmorrhage, as a rule, occurs rarely before the forty-fifth year. A hereditary predisposition is also often observed, together with a certain "habit" of body. In atheroma the same conditions exist.

Disease of the arteries, and more particularly miliary aneurysms, being thus regarded as the chief cause of cerebral hæmorrhage, there seems to be little doubt that an abnormal rise of blood-pressure is also an important exciting factor. If it is granted that the change of the arteries exists, it can be inferred how a temporary elevation of blood-pressure may act on the current and tension of the blood, and on the arterial walls. Thus cerebral hæmorrhage may follow great muscular exertion, straining at stool, indulgence in alcohol, extreme joy or anger, excessive venery in old people, or it may occur in cardiac hypertrophy, when there exists also contracted kidney disease.

Cerebral hæmorrhage is not always dependent on miliary aneurysms. It may be simply symptomatic of impaired nutrition of the whole frame, and hence of diminished resisting power of the vascular walls. Thus in pernicious anæmia, scurvy, purpura, septicæmia, typhus, typhoid fever, or small-pox, cerebral hæmorrhage may occur, but not to such a great extent as when it is due to miliary aneurysm. The hæmorrhage in impaired nutrition is usually of a capillary character.

Clinical History.—Previous to the attack there may be symptoms which warn the patient of danger. Notably among these are defects of vision, dizziness, faintness, and sickness, or a peculiar difficulty in expressing ideas in articulate language. These prodromata may extend over weeks or months. But these prodromata may not exist, and suddenly, without warning, the patient, apparently in vigorous health, is struck down abruptly as if shot, and is rendered thoroughly unconscious with loss of sensibility and motion. In such instances the name *apoplectic stroke* is very appropriate. This attack may be rapidly fatal, owing to the abnormal pressure paralysing the cardiac and respiratory centres situated in the medulla oblongata.

Another form of cerebral hæmorrhage is preceded by sickness and faintness and a state of syncope. From this state the patient may recover and be able to walk. After a few hours, the headache continuing, he becomes oppressed, and sinks into a comatose condition. Again, there may be a sudden attack of hemiplegia, with loss of speech, which, after the lapse of a few hours, gradually passes into coma. In whatever way the cerebral hæmorrhage occurs, there are certain phenomena very evident during its continuance. The pulse is usually at first small and feeble, but gradually becomes fuller, stronger, and slower as the shock passes off. The temperature is found at first to be low, 96·8° F., afterwards normal, 98·5°, so continuing if recovery is to be complete; but if a fatal result is to ensue, it rises to 104° F. or 106° F.

Respiration is embarrassed, slow, and sometimes irregular. In all the severer forms it is markedly laborious, and accompanied by stertor, and frequently foam or frothy saliva is blown from the mouth with considerable force. This latter symptom is justly considered an indication of great danger.

The "Cheyne-Stokes" respiration is sometimes observed. This respiration is marked by a series of respirations, becoming shallower and shallower until it altogether ceases; then after a long pause the series begins again, and the respirations again grow deeper and deeper until the maximum is once more reached.

The face is generally pale and the skin is warm, and bathed in perspiration, but in very bad cases a cold clammy sweat is observed. The teeth are closely clenched, and the power of swallowing, though not completely lost, is for the most part so much impeded as to oppose serious obstacles to the administration of remedies. Older writers state that the pupils are permanently dilated. In the worst cases they will not respond to light, and in others they do so, but in a sluggish manner. The duration of the apoplectic fit lasts from two or three hours to as many days; about thirty hours may be considered an average. When perfect coma exists, attended with all the symptoms mentioned, the case ends fatally; but when a recovery ensues, either perfect, temporary, or partial, it will usually be observed that the symptoms mentioned are not severe; that the breathing is not stertorous; that the pupil does react to light; that sensation is not completely lost, for instance, there is an evidence of feeling when the limb is grasped.

Under such circumstances the prognosis is more favourable, but it is still to be remembered that recovery is rarely complete, and a relapse may at any time supervene. In a large proportion of cases, the patient on recovering consciousness is found to be suffering from *Hemiplegia.*

Hemiplegia or a paralytic stroke is most commonly due to hæmorrhage into the brain-substance, though it may be associated with other cerebral affections. As the result of this or of some other cerebral disease, the left side of the body is most commonly found paralysed, although the actual seat of the lesion in the brain is on the right side in the great majority of cases. The decussation of the pyramids accounts for this phenomenon. Owing to the affection of the facial nerve, the cheek hangs loosely with the angle of the mouth slightly drawn upwards to the sound side; and the tip of the tongue, by the action of the healthy hypoglossal, is pushed to the paralysed side when it is protruded, the counterbalancing power of the corresponding muscles being lost. The articulation is imperfect, and, if the third nerve is also involved, the upper eyelid droops, the pupil is dilated, and there is a divergent squint. The loss of motion may be complete in the arm and leg, and the patient lies in bed helpless. If it is partial, or if the original attack is passing away, the gait is characteristic. The affected leg is drawn after the sound one in a shuffling manner, and the toes, if indeed the patient is able to lift the foot so far, are pointed to the ground.

Crossed hemiplegia occurs when a lesion is in the lower section of the pons varolii, in which the facial nerve is involved as it passes through the pons after it has left its nucleus; whereas the motor fibres involved in the lesion are above the point of their decussation, so that facial paralysis occurs on the same side as the lesion, and paralysis of the arm and leg on the opposite side.

The sensory disturbances are variable. In many instances there is only slight numbness of sensation, or there may be hemianæsthesia. Complete hemianæsthesia is, however, rare in hæmorrhage.

Hemiplegia may be permanent, or it may tend to recovery, which commences in the leg.

After-effects.—Hemiplegia is often recovered from, and, as a rule, the legs recover before the arms. But hemiplegia may be permanent, and the affected muscles of the arm or leg may pass into a state of contraction, which is usually termed "late rigidity." In the arm it generally consists in a flexion of the various joints—thus the elbow is bent at a right angle, the wrist is pronated and folded on the forearm, and the fingers are drawn in upon the palm of the hand. The leg is less apt to become contracted than the arm, even when it remains paralysed, but there may be flexion at the hip and knee joints. The cause of "late rigidity" has given rise to considerable controversy. The idea that it was due to slow contraction of an apoplectic cyst, or to a chronic inflammation in the substance of the brain, has been abandoned, and two theories now have advocates. (1) Bouchard and Charcot believe that sclerosis develops at the seat of the lesion, and entails a degeneration of the nerve-fibres which pass down the cord from the brain in the lateral columns. These lateral columns, however, contain a number of nerve-fibres, probably arising from spinal nuclei, unaffected by the degeneration, and these unaltered fibres are irritated and cause "late rigidity." Charcot, however, maintains that not merely the lateral columns, but also the anterior and posterior gray cornua, are affected, and produce in the former case atrophy in the muscles, in the latter partial anæsthesia. (2) Hitzig's theory is drawn from what is observed in hemiplegic limbs after a night's sleep. They are supple and they are flaccid. But if the patient exerts the sound limb, as by getting out of bed, then contraction and rigidity of the paralysed muscles follow. He instances also as corroborative proof a fact well known, that the hemiplegic arm of a patient, which he is unable to move voluntarily, may be jerked into the air when he yawns or stretches himself. He assumes that the spinal centres are in a state of irritation, and that the "contractions of hemiplegic limbs represent an excess of those co-ordinated movements in distant parts which naturally accompany every action of the body."

Without attempting to favour any of the opinions alluded to, we may affirm that the seat and nature of some spasmodic affections following on hemiplegia are still unknown. They are recognised by their symptoms, which, however, vary in different cases. Sometimes a tremor is occasioned by the effort to perform some voluntary act, or it may be observed when the part is at rest. Sometimes the spasms of the limbs affected are choreiform in character, and to these has been applied the term POST-HEMIPLEGIC CHOREA. Sometimes the parts connected with the spasms cannot be kept still. They are constantly moving, except during sleep, and hence Dr. Hammond of New York designated this continual motion ATHETOSIS (ἄθετος, without a fixed position). The fingers are alternately flexed and extended, and the same lack of repose is observed in the toes.

EMBOLISM AND THROMBOSIS (*Cerebral Softening*).—(a) *Embolism*.—Arrest of the blood-supply in the brain may be due to a cause acting outside the cranium, as when a ligature or compression is applied to the carotid artery, which may bring on immediate paralysis or lead to paralysis in a day or two. Such arrest of the supply is however rare, and in the great majority of cases the arrest is connected with the circulation inside the cranium. In the great majority of cases the embolus comes from the left heart, and is either a vegetation of a fresh endocarditis, or more commonly from a recurring endocarditis, or from the segments involved in an ulcerative process, but sometimes the puerperal condition favours its occurrence. The majority of cases of embolism are connected with chronic heart disease.

The embolus is carried very much oftener into the left carotid than the right, because of the more direct course of the blood in the former. In the majority of cases it is not lodged below the circle of Willis, but is carried into the branch which forms the chief direct prolongation of the carotid—the arteria fossæ Sylvii.

(b) *Thrombosis.*—Clotting of blood in the cerebral vessels, most commonly in the middle cerebral and in the basilar arteries, is the result of some lesion of the arterial wall (of the nature either of arterio-sclerosis or syphilitic endarteritis). Occasionally it occurs not from disease of the vessels but is dependent on a very feeble circulation, as in continued fever or pneumonia of a low type, and in cancer.

Anatomical Changes following Embolism and Thrombosis.—However originated, the effects of the obstruction by embolism or thrombosis are practically the same, and result in (1) no harm being done, because the collateral circulation set up is sufficient to nourish the brain substance deprived of its usual blood-supply. (2) If this collateral circulation is not efficient, then there is a lack of nourishment, and structural changes occur, which have been designated "red softening." This structural change of red softening is not due to inflammation, but to the back-flow of venous blood into the area supplied by the obstructed artery. It may be termed hyperæmic engorgement, and through changes which occur in the vessels involved, there may be a possible escape of red corpuscles, with a further stage of "yellow" or "whitish yellow softening"; or if this escape of red corpuscles does not occur, then softening may be present from the onset. In general terms, the entire pathological process is now justly recognised as necrobiosis, and microscopic examination within the first twenty-four hours shows nothing abnormal (in the cases where engorgement and extravasation exist) except the presence of red blood cells. At a later period the nerve elements undergo gradual degeneration, just as the fibres of a peripheral nerve do after section of the trunk, and this retrograde metamorphosis increases until finally the yellowish semi-fluid mass contains only fatty detritus, drops of fat, and in addition sometimes blood-crystals.

Symptoms.—In *embolism*, the patient is usually the subject of a heart affection. The onset is sudden, with no premonitory symptoms, and as in cerebral hæmorrhage leads to loss of consciousness and hemiplegia.

When the embolus blocks the left cerebral artery the hemiplegia is usually associated with aphasia.

In *thrombosis* the onset is more gradual, and there may be premonitory symptoms—headache, vertigo, tingling in the fingers, loss of memory, with numbness of an arm or leg or of one side of the body. Abrupt loss of consciousness is not common, and when the lesion is small consciousness may be retained.

The hemiplegia following embolism or thrombosis has the same characteristics, primary and secondary, described under hæmorrhage.

Diagnosis.—Cases of cerebral hæmorrhage in which the onset is gradual, a day or two elapsing before the paralysis is fully developed and consciousness completely lost, are readily recognised, though it is then difficult to determine whether the lesion is due to thrombosis or hæmorrhage. Cases in which the hæmorrhage is large may produce sudden loss of consciousness and coma, and this condition, generally known as apoplexy, may simulate coma from uræmia, alcoholism, opium poisoning, concussion, or epilepsy. In all cases the previous history will afford valuable data for diagnosis, and more especially is this evident in determining between apoplexy and epilepsy and concussion; for if dependent on epilepsy, the attack will not be long and there will be an account of former seizures; if due to concussion, there may be injuries or bruises on other parts of the body, probably bleeding from the ears or nose, and other circumstances tending to the supposition that the insensibility is due to injury wilfully or accidentally inflicted. In drunkenness the patient can be aroused to some extent, the pupils are dilated and react to light; there is no hemiplegia, and the smell of the breath will betray alcohol. As drunkenness and an apoplectic seizure may, however, exist together, the diagnosis should be guarded; and if a doubt exists, it is better to err on the safe side and act as if they were combined. In uræmia there is no hemiplegia; the urine, if drawn off by a catheter, will be found to be albuminous; and there will in all probability be indications of dropsy in other parts of the body.

In opium poisoning the pupils are contracted, there is no hemiplegia, and there are no remissions in the insensibility, but, on the contrary, deepening coma.

In all doubtful cases it is advisable to use the stomach-pump.

Prognosis.—The prognosis in cerebral hæmorrhage must in every case be very guarded, and based on the total or partial coma which exists. As a general rule it may be said that in severe seizures death occurs in a few hours; in the less severe, about one-third of those attacked die at varying intervals; while in mild cases the prognosis is more favourable when the eighth day is passed without a relapse. In any case of cerebral apoplexy, the following symptoms are of grave omen: persistence or deepening of the coma during the second or third day; rapid rise of temperature within the first forty-eight hours after the stroke; the rapid formation of bed-sores, the malignant decubitus of Charcot.

With regard to the hemiplegia no definite opinion can be given for some weeks. In slight cases it may entirely pass away. If persistent at the end of a month some grade of permanent palsy is certain to remain, and gradually the late rigidity supervenes.

In any case it must be remembered that the capacity for mental or physical efforts is never what it was previous to the attack.

Treatment of Cerebral Hæmorrhage.—If there are any fore-warnings, the bowels should be opened by a brisk purgative; the patient should be kept in bed, with his head cool and well raised; every mental strain should be avoided, and 30 grains of the bromide of potassium ordered at night to secure rest. If the patient is seen early in the course of the fit, if he is robust and plethoric, if his face is deeply congested, if there is visible pulsation of the carotids, and if the pulse is full and slow, then in all probability increased arterial tension continues, and to obviate this, venesection is the most speedy and effective remedy. We cannot by this means remove the blood already effused, but we may prevent further effusion by lessening the tension of the cranial vessels. Blood should be drawn from the arm to the extent of one or two pounds. If evidence of increased arterial tension does not exist, or if the patient is not seen at an early stage of the attack, then it is inadvisable to bleed, but rather to put in force means which the course of the shock indicates. Thus the bowels should be emptied by enemata if the clenching of the teeth prevents the administration of croton oil; the urine, if not passed naturally, should be drawn off with a catheter, and if the hæmorrhage still seems to be going on, a hypodermic injection of ergotin should be tried. The head and shoulders should be elevated, and when dyspnœa, stertor, and signs of mechanical obstruction are present, the patient should be turned on his side.

The immediate treatment of *embolism* and *thrombosis* obviously does not require venesection or active purgation. If, as is often the case, the heart's action is feeble and irregular, stimulants and small doses of digitalis may be given. The after-treatment practically corresponds to what should be done in cases of cerebral hæmorrhage. We must treat symptoms in both cases. Thus bromide of potassium may be given at night to procure rest and sleep. The daily evacuation of the bowels should be seen to, and the progress of recovery should not be interfered with by allowing friends to enter the room, and by fussy inquiries as to the patient's condition. After three or four weeks, the constant current, as indicated at p. 415, should be applied to the paralysed limbs to maintain the nutrition of the muscles, and, if possible, to prevent contractures. Gentle massage by an experienced masseur or masseuse should also be employed, and strychnine or phosphorus given (F. 85).

Dietetic and Climatic Treatment.—The diet should be at first fluid and easily digestible. Care must be taken to prevent the patient choking, which may lead to pneumonia from food entering the lungs. In the hemiplegia which follows on apoplexy, certain health resorts, as Wildbad, Ragatz, Teplitz, Bath, and Wiesbaden, are specially useful. When circumstances prevent a patient from going to these places, warm baths at a temperature of 96° F. may be taken, medicated with common salt, three or four times in the week, and should be followed by massage.

Since aphasia is usually caused by a lesion of a cerebral artery, we consider it advisable that a description of it should now be given.

APHASIA

is the name given to a defect of speech from cerebral disease. The cause is usually an embolus or a small hæmorrhage, or it may occasionally be due to functional derangements as from overwork or great excitement.

The term "aphasia" does not mean loss of voice—aphonia—which is due to an affection of the laryngeal muscles; nor impediment of articulation, as at the onset of hemiplegia; nor the thick and blurred speech of bulbar paralysis, due to imperfection in the movements of the tongue and palate; nor the silence apparent in mental disease independent of demonstrable lesions of the cerebral centres. It means a disorder of the faculty of communicating thoughts, arising from defect of the cerebral speech-processes in the cortex of the brain, and these processes are divided into *motor* and *sensory*. By the former language is uttered, and by the latter it is received.

By *motor aphasia* is understood the loss of out-going language, and the seat of the lesion is the posterior part of the *third left* frontal gyrus, usually termed Broca's convolution. In a case of motor aphasia from the destruction of this motor speech-region the patient is at first speechless, and even the power of expression by signs may be impaired. He may shake his head when he means "yes." Before long, expressions by gestures become accurate and the patient regains the power of uttering a few simple words, as "yes" or "no." He is able to understand whatever is said to him, but he cannot repeat it. He cannot write out what he means (*agraphia*), even if his hand is unaffected by hemiplegia, yet he may be able to translate printed letters into written characters. Processes of thought are little interfered with, and he is perfectly aware of his errors in utterance. His puzzled look changes to one of satisfaction when some one pronounces the word he attempted to utter. In some cases this condition persists for years. More often there is after some months a slow recovery; first one word is uttered, then another, and considerable power of speech may be regained by the "re-education" of the right hemisphere.

By *sensory aphasia* is understood the loss of in-going language, the inability to apprehend the meaning of words which are still heard as sounds—*word-deafness;* or the power of understanding printed or written words—*word-blindness.*

Word-deafness is due to a lesion in the first temporal convolution. Heard words are not understood by the patient. He has, however, more command of words than in motor aphasia, and words may still be uttered automatically as in singing a song. Parts of speech in more general use, prepositions, adjectives, verbs, are readily uttered, but there is great difficulty with more special words, as nouns. In attempting to recall a special word he employs a circumlocution. Instead of the word "knife" he may say "something to cut with."

In word-blindness the patient has lost the power of understanding printed or written words. He can understand spoken language and can himself speak perfectly. He may even be able to write down his thoughts, but after having done so he is unable to read what he has written. The situation of the lesion here is in the occipital lobe of the brain—at the centre for the reception of visual impressions.

Another variety of sensory aphasia is called "amnesic aphasia." The essence of the defect in amnesic aphasia lies in the fact that the patient's speech is defective because of his inability to recall the proper words for the expression of his thoughts or wishes, and he very frequently substitutes wrong words or names in the place of those he wishes to employ, as when speaking of his "hat" he calls it a "brush," or when seeking a "pen" he calls it a "knife." In a bad case of this kind the patient's speech is rendered unintelligible because of his inability to arrange words into a sentence, capable of conveying a definite meaning. The seat of the lesion has been referred by Wernicke to an interruption of the path between the auditory and motor centres by disease of the island of Reil.

The lesions in cases of aphasia are most commonly but not invariably found in the left hemisphere. They are in fact found in the left hemisphere in right-handed persons; in the opposite hemisphere when the patients are left-handed. It must always be remembered that, when the left hemisphere is the seat of the lesion, the uninjured right hemisphere may take on the lost functions, and the symptoms of the loss may thus gradually pass away.

Treatment.—Without entering into details we may say that recovery, or, at any rate, improvement of speech, may occur, even in organic lesions, from education of the sound hemisphere. The process is necessarily slow, and must be aided by mental and bodily rest, with careful attention to digestion in selected articles of food. In the majority of cases the issue is not hopeful, yet when aphasia depends, as it sometimes does, not upon organic lesions but on functional disturbances, we have more confidence in expecting recovery.

AFFECTIONS OF THE SUBSTANCE

Inflammation of the Brain

(*Suppurative Encephalitis—Abscess*)

Etiology and Pathology.—Suppuration of the brain substance is seldom or never a primary affection, but results, as a rule, from extension of inflammation from neighbouring parts, or infection from a distance by the blood. There are three important factors. (1) Traumatic injuries, as falls upon the head, or blows; fracture or punctured wounds. (2) Diseases of the ear, especially suppurative inflammation of the tympanum. (3) Septic processes. Localised bone disease, suppuration of the liver, ulcerative endocarditis, but above all certain inflammations in the lungs (gangrene, bronchiectasis, fœtid bronchitis), are liable be followed by abscess.

The abscess may be solitary or multiple, diffuse or circumscribed. In acute cases following traumatic injuries the suppuration is not limited, but in chronic cases the abscess may be enclosed in a definite capsule. In acute cases the pus is mixed with reddish debris and softened brain matter, but in a chronic encapsulated case the pus has a greenish tint, an acid reaction, and a peculiar odour like sulphuretted hydrogen. The brain substance surrounding the abscess is œdematous. The size varies from that of a walnut to a small orange. In four-fifths of all cases the abscess is solitary. Though in many cases the abscess is found intact, yet it may rupture on the surface and set up meningitis; or into the lateral ventricles; or it may form a communication through diseased bone with the tympanum, and discharge externally.

Symptoms.—The symptoms in the *acute* cases are severe and continue to the end. The most constant is *pain*, intense, agonising, continuous, and often corresponding to the position of the abscess. There is also more or less fever, vomiting, sometimes rigors. In the *chronic* cases there is often a latent period with but slight symptoms. Eventually the symptoms become more pronounced, the most characteristic being headache, vomiting, slow cerebration, optic neuritis, and drowsiness increasing to insensibility. Sometimes there is a slow pulse and subnormal temperature; in other cases intermittent fever and rigors.

Treatment.—Abscess of the brain is not altogether beyond the range of *prevention* when due to its most frequent cause, local bone disease. This should be subjected to sedulous and persevering treatment, and in ear disease, especially, the free discharge of the products of suppuration should be promoted and careful disinfection practised. Tonics, cod-liver oil, and fresh air are most important aids to lessen the tendency of the cerebral disease to spread. Surgical interference, when acute symptoms have developed, affords the only chance for the patient, and fortunately operative proceedings have now proved practicable and successful.

TUMOURS OF THE BRAIN

The most common varieties of new growths in the brain are :—

1. TUBERCLE, which may form small or large growths. They are usually multiple, and most numerous in the cerebellum and about the base. They are most frequent in early life; in one half of the cases the patients are under ten years of age.

2. GLIOMATA.—This consists of an over-growth of the connective tissue or *neuroglia* of the brain. A hard and soft variety are recognised, but the latter is much more common, and the vessels in it easily rupture and give rise to hæmorrhage, which, however, rarely extends beyond the limits of the growth.

3. SYPHILITIC GROWTHS (*Syphilomata—Gummata*).—The tumour grows commonly on the surface of the brain, at first in the pia mater, and subsequently invades the substance of the brain and contracts adhesions to the dura mater. The tumour is irregular in shape; size varies from that of a hazel nut to a chestnut; consistence not uniform; pinkish-red on section in the outer parts, yellowish and cheesy in the centre.

Other kinds of cerebral tumour are sometimes seen, as sarcoma, carcinoma, myxoma; cysts, fibroid growths; aneurysms.

Etiology.—Tubercular growths often occur in association with caseous changes in the bronchial or other glands. Syphilitic growths are always tertiary, never congenital. Some of the new growths are secondary to other growths elsewhere.

Symptoms.—(1) General. *Headache*, dull, aching, or excruciating, may be felt all over the head, or be limited to one region.

Optic Neuritis.—This occurs in four-fifths of all the cases. It is usually double.

Vomiting.—This is a common feature and occurs without any nausea or any definite relation to meals. Headache, optic neuritis, and vomiting make up the characteristic symptom group of a cerebral tumour. Other symptoms are noted, as giddiness, mental disturbances, hemiplegia, convulsions, either general and resembling true epilepsy, or localised as in Jacksonian epilepsy.

The *localising* or *focal* symptoms belong to the domain of experts, and cannot be explained in the compass of this hand-book.

Diagnosis.—From the clinical symptoms alone the existence of a tumour may be determined, for the combination of headache, optic neuritis, and vomiting is distinctive. Careful reflection will determine the difference of these symptoms from those of uræmia, general paralysis, and epilepsy.

The *diagnosis* of the variety of cerebral tumour is important and somewhat difficult. If the patient be a child or a young person the probability is tubercle, and the older the patient is the greater is the certainty that the tumour is not tubercular. Above the age of forty tubercle may be left out of the question, and the diagnosis is between a syphilitic tumour and other forms. The history of the case, the examination of the person for enlarged glands, scars on the skin or mucous membranes, must be carefully seen to, even though the patient denies having had syphilis. In all doubtful cases, especially in middle-aged adults, there is nothing to lose, but much to gain by prescribing remedies known to do good in syphilis.

Treatment.—If syphilis be diagnosed as the cause of the cerebral affection then the treatment should be distinctly and decidedly mercurial, and experience has shown that in cerebral syphilis inunction with mercurial ointment is the most satisfactory method. At least a drachm should be rubbed in every day, and continued until its action on the system is apparent. In some cases improvement appears after the fourth or fifth day. If, after 20 or 30 drachms have been used, there is no benefit, then the inunction should be stopped, as after that time there is little prospect of its doing good, and this is in all probability due to a wrong diagnosis having been made. Even large doses of iodide of potassium from the nature of the case seem to be inadequate to produce the desired effect of procuring absorption.

DEGENERATIONS OF THE BRAIN

Chronic Progressive Softening.—This affection is almost always situated in the white substance of the hemisphere, a feature in which it differs from the acute softening of actual obstruction. The change consists of simple white softening, which presents under the microscope simply the products of degeneration. The extent of the lesion varies much in different cases; subcortical softening may even extend through the whole convexity of one hemisphere.

The *causes* of chronic progressive softening are hardly known. All that can be said is that it occurs in both sexes, and is a disease of the second half of life, most frequent between sixty and eighty. The chief *symptoms* are hemiplegia —motor and sensory—of gradual onset. The intellect may be little affected, or the patient may become apathetic and dull, and, towards the last, comatose. Death ultimately occurs from bed-sores, pneumonia, or some intercurrent senile malady. The *duration* of recorded cases has varied between a few months and two years, but the onset cannot be easily fixed.

Treatment.—No treatment appears to have any appreciable influence on the course of the disease. Probably the most suitable measures are rest, nutritious food, with general and cardiac tonics.

Disseminated or Insular Sclerosis (Sclérose en Plaques Disseminées of the French, or Multiple Sclerosis of the Germans) is a chronic disease characterised by patches of sclerosis irregularly distributed throughout the brain or cord, or both. The patches are found both in the gray and white matter. On section they appear as grayish-red areas; microscopically, show increased neuroglia formation. The nerve-fibres lose their medullary sheaths, but the axis-cylinders persist. In the gray matter the ganglion cells may be shrunken and pigmented. The *etiology* is obscure. It occurs most commonly among young people.

Symptoms.—The onset is slow. According to Buzzard, the early symptoms are often transient paresis of a limb with numbness and tingling. In other cases, blurred vision with slight optic atrophy and external squint are first noted. When the disease is fully developed there are three important and characteristic symptoms: (*a*) *tremor of muscles* on attempting to move; (*b*) a peculiar manner of speaking, *scanning* speech; (*c*) *nystagmus.* (*a*) There is no paralysis of the arms, but if the patient attempts to seize any object, to pick up a parcel or convey a glass to his head, there is trembling or oscillation. If he be excited the tremor is more pronounced and may extend from the arm and fingers to the head, trunk, and lower extremities. *When the patient is perfectly quiet there is no tremor.* (*b*) *Scanning speech;* the words are pronounced in a slow, *deliberate*, separate manner. (*c*) Nystagmus or oscillation of the eyeballs is brought out when the eyes are fixed upon any object. In some cases there is marked paresis of the lower extremities, but more frequently spastic symptoms are shown (see p. 442). Gradually manifestations of mental weakness occur, marked by imbecility, and eventually, after headache and vertigo, there is loss of consciousness and hemiplegia.

The *prognosis* is very unfavourable, for although the affection may last a long time, there can be no hope of permanent recovery.

Treatment.—Of all medicinal remedies nitrate of silver, in $\frac{1}{4}$-grain doses thrice daily, seems the best, if carefully and continuously given: the amount should never exceed in all 200 grains, so that discoloration of the skin may be avoided.

ASSOCIATED PALSY OF THE BULBAR NERVES (Labio-Glosso-Laryngeal Paralysis).—There are two common forms of this disease, viz. (*a*) a chronic form, and (*b*) a sudden form; the latter is often termed acute, and is, as a rule, sudden in onset.

CHRONIC LABIO-GLOSSO-LARYNGEAL PARALYSIS (*Synonyms*, Chronic Bulbar Paralysis, Progressive Bulbar Paralysis).—A progressive symmetrical paralysis of the lips and adjacent facial muscles, of the tongue, pharynx, and sometimes also of the larynx, "with or without conspicuous wasting," and often associated with muscular atrophy elsewhere.

Etiology.—Of the causes of the affection little is known. It is a disease of later life, being almost unknown in persons under forty. Males are affected more frequently than females.

Symptoms.—The distribution of the symptoms is indicated by the name, the affected parts being the lips, tongue, throat, and larynx. They are, so to speak, arranged about the tongue as a centre. The patient becomes aware of a gradual difficulty in pronouncing certain words correctly, especially those in which the tongue has to be pressed against the teeth or hard palate, those for instance in which the consonants t, d, k occur. The tongue at first can still be protruded although not so far as normally, but, as the disease progresses, it gradually becomes atrophied and lies immovable on the floor of the mouth. Owing to the loss of power in the tongue, the food is with difficulty pushed back into the pharynx. When the lips become involved the power of whistling is lost. Swallowing and mastication become more and more difficult, and saliva dribbles out of the open mouth. The muscles of the vocal cords waste, and the voice becomes feeble. The mind usually remains clear. The *course* of the disease is slow but progressive, and death occurs in from two to five years, from inanition, broncho-pneumonia; the entrance of food into the air-passages; sometimes from choking, and occasionally from implication of the respiratory centres.

Pathology.—Microscopic examination of the medulla shows atrophy and degeneration of the nerve-roots and corresponding nuclei of the hypoglossal and facial, the vagus and accessorius. The atrophied muscles present appearances identical with those seen in progressive muscular atrophy.

Treatment.—Our only hope in any treatment is to retard the progress of the disease. Nervine tonics, strychnine, arsenic, phosphorus, or nitrate of silver may be given, or hypodermic injections of strychnine ($\frac{1}{60}$ gr.) administered. Electrical treatment is very unsatisfactory. The *diet* of the patient demands care. Semi-solid pulpy food can be swallowed better than liquids or solids. In late stages, when deglutition is impossible without constant risk of the entrance of particles of food into the air-passages, liquid food may be given by an œsophageal tube, or by means of a soft india-rubber tube passed through the nose into the upper part of the œsophagus. The food may be slowly poured into the tube through a small funnel, the patient's head being held back.

Sudden Labio-Glosso-Laryngeal Paralysis (*Synonym*, Acute or Apoplectiform Bulbar Paralysis).—This condition is sometimes noted after injury or as a sequela to an acute infectious fever. Frequently it is caused by embolism or hæmorrhage into the pons and medulla.

Symptoms.—The onset is sudden—hence the term "apoplectiform"—often with headache and giddiness, rarely with loss of consciousness. The patient suddenly finds a difficulty in swallowing and in articulation with inability to protrude the tongue; cough, dyspnœa, and hiccough may be present. There may be convulsions and weakness in the limbs, sometimes with tingling. Usually such cases die in the course of a few hours, but occasionally a case with a sudden onset may become chronic and exhibit all the symptoms of the chronic form, or the symptom group may be incomplete. The course of the disease is not progressive, and if the patient recovers from the immediate effect of the lesion the prognosis is better than in the chronic form, especially if the mischief be due to syphilitic disease.

Treatment.—The treatment is the same as in the chronic form.

CHRONIC HYDROCEPHALUS

This is commonly termed "water on the brain," and not unaptly, because it consists essentially of an accumulation of fluid in the ventricles, or in and beneath the arachnoid. The head is, in consequence, altered in form and enlarged in size. The fontanelles are open, the forehead is prominent, and the face and body appear thin and wasted. With such signs it can hardly be mistaken for any other disease except that produced by rickets, but the other characteristic symptoms of rickets are not present, viz. restlessness, sensitiveness, and profuse perspirations of the head.

In many cases it is congenital or is detected about the sixth month, and lasts for a varying term of months or years, death occurring with coma or convulsions, or by an intercurrent malady, as measles or hooping-cough. Occasionally, if the quantity of fluid is not large, recovery takes place, but in all cases of partial or complete recovery there is a tendency for the disease to come back.

Treatment.—Compression of the head by narrow strips of adhesive plaster has been used, but a safer and more manageable method is an elastic band, two or three inches wide. Care must be taken to shift the band from time to time, for continuous pressure has a tendency to produce sloughing. If it be decided to try the effect of a puncture, a fine trocar should be inserted at the outer angle of the anterior fontanelle. Not more than one or two ounces should be taken away at a time, and the head should then be strapped. If no harm results, a similar quantity should be taken away after two or three weeks. Cases have been recorded where hyd. c. cretâ in small doses, followed by iron, was beneficial.

GENERAL PARALYSIS OF THE INSANE

Synonyms, General Paresis, Dementia Paralytica

This mental disease is important owing to its frequency, and that at an early stage it comes under the notice of the general practitioner.

The disease chiefly affects males between the ages of thirty and fifty. The causes vary. In 70 to 90 per cent of all cases a history of syphilis is noted. Other important factors are alcoholic or sexual excess, overwork and mental strain.

Pathologically we find thickening of the membranes with atrophy of the brain. The skull is thickened and the dura adherent to it. Beneath the dura may be false membranes. The arachnoid is opaque, milky, and thickened. The pia mater is tough, vascular, and adherent to the convolutions at places. The brain itself is atrophied and firm. The ventricles dilated and the ependyma granular.

Symptoms.—The symptoms are divided into mental and physical.

1. Mental.—Mental symptoms generally precede the physical. The first indications are sleeplessness and restlessness, and an inability to speak, write, read, sing, or fix the attention on any particular subject. This enfeeblement of

the mental powers gradually advances, until absolute fatuity results. Before the latter stage is reached there are generally extravagant ideas observed by friends, such as the fancied possession of great wealth, infinite power, or colossal size. Wild schemes are seriously entertained, and hopefulness in a fair and brilliant future, notwithstanding dubious surroundings, is daily intensified.

2. Physical.—The physical symptoms are great fatigue after slight exercise and utter prostration after any unusual exertion. There is a convulsive tremor of the upper lip after any excitement, and a trembling in the tongue when an attempt is made to hold it out. This paralysis of the lips and tongue leads to defective blurred articulation, and the face loses all expression, and assumes a sad or blank look. Tremor of the feet is noted in performing simple actions, such as getting out of cabs or walking down stairs. These symptoms are succeeded by a general and progressive loss of co-ordination. As the disease advances to its almost invariably fatal termination, the physical strength diminishes, and the patient, unable to walk, stand, or sit, is confined to bed for the rest of his existence, death occurring either from the difficult deglutition leading to choking, or from sheer exhaustion or some intercurrent affection. Atrophy of the optic nerve can often be detected by the ophthalmoscope, and it is noticed sometimes at an early stage that there is an unequal contraction of the pupils, and occasionally a fixed squint.

Prognosis.—The ordinary duration of the disease is from a few months to three years. Complete recovery seldom occurs.

Treatment.—If the disease is detected in its very early stage, the patient should avoid all irritation, abandon if possible his usual business, be much in the open air, and take regular walking exercise every day. Sexual intercourse should be avoided. Light novel-reading should be enjoined, and amusement, such as playing at whist, recommended in moderation. Occasionally, by strict observance of the injunctions mentioned, aided by the kindness of friends, the dreaded malady may be averted. When, however, this is not the case, and the malady steadily advances, all that can be done may be accomplished by careful nursing at home, and, if possible, without removal to any asylum.

GENERAL AND FUNCTIONAL DISEASES OF THE NERVOUS SYSTEM

The diseases under this title are so different in character and so various in seat that their classification into groups is alike difficult and useless. The order in which they are described is simply based on convenience.

CHOREA

Chorea (*Synonym*, St. Vitus's Dance) literally means a dancing or jumping, being derived from the Greek word *χορεία*. It is the "Saint Vitus's dance" of this country, the "Veitstanz" of Germany, and "Saint Guy" of France. It may be defined as a disease most commonly affecting girls between the sixth and the sixteenth years, and characterised by irregular action and restlessness of the voluntary muscles of the face and limbs. It sometimes attacks boys. It may follow rheumatism, especially when this is a sequela of scarlet fever, and women are liable to it during their first pregnancy.

Etiology and Pathology.—All authorities who have carefully considered chorea seem to agree that the exciting cause is fright or some severe mental shock; but after this agreement ceases as to its site. So great is the divergence that some, notably in France, state that the disease is spinal, while in our country it is generally believed that it is seated in the sensory-motor ganglia, at the base of the brain, and especially in the corpora striata. But as to the nature of the change in these, difference among our leading physicians again is apparent. Some have suggested embolism of the minute arteries in the region of one or both of the corpora striata; some have adopted primary or simultaneous endocarditis; some, unable to find a satisfactory anatomical basis, simply classify it as a neurosis.

Since autopsies reveal absolutely nothing abnormal in the central nervous system of genuine chorea, we are inclined to accept, in the meantime, the agnostic view, and in adopting it we must remember that at the epoch of life when chorea occurs there is in young females an unstable and special activity of the sensory-motor ganglia. There is a condition of high tension. The fright or mental shock produces cerebral anæmia, which, momentary though it may be, is still sufficient to lower the functional vigour of the ganglia and originate the train of symptoms connected with chorea. This view accords with the special action of arsenic and nervine tonics upon the disease.

Symptoms.—In chorea there is power without control of muscular movements, so that there is an inability to keep at rest when awake or to perform voluntary movements in a satisfactory manner. If the patient means to sit or stand still, she (for it generally affects females) begins to fidget, and if she attempts to walk, there is no steady progress, but a halting and dragging of the feet over the floor. Even in sitting the hands do not remain steady, for one hand is laid palm upwards on her lap and suddenly reversed. On being asked to shake hands she attempts to do this, but firm pressure is supplanted by a wriggling, unsteady squeeze. Being requested to show her tongue, she appears unable to do so, and then suddenly protrudes it, and as suddenly withdraws it, with a snapping movement of the jaws. The articulation is also impeded, the respiration is irregular, and deglutition sometimes impaired. In severe cases she is unable to feed herself. Looking at her or drawing attention to her condition increases the irregular and purposeless movements. In a hospital a patient recovered from chorea may relapse if she sees a case suffering from the same affection admitted into the ward. Often a blowing systolic murmur is heard over the cardiac region, and the cause of the murmur is differently explained. Some state that it is functional, some that it is due to choreic spasms of the musculi papillares interfering with the closure of the mitral valves, while others attribute its occurrence to endocarditis such as is seen in the course of rheumatism. During sleep the movements cease. If chorea attacks one side of the body only it is termed "hemichorea," and is then sometimes associated with "hemianæsthesia."

The duration of the disease may, as a rule, be stated to be from two to three months, but it sometimes assumes a chronic form and lasts much longer. It seldom terminates fatally, except when, as rarely happens, it is very acute and complicated with other affections, as cholera or acute rheumatism.

In the fatal cases, which have occurred from the disease *per se*, the temperature was high, the spasms intense, and at last movements ceased with the supervention of a comatose state and involuntary passage of fæces and urine.

Treatment.—After the action of the bowels has been secured by an aperient mixture, and followed by an anthelmintic if there is any suspicion of worms, the patient should have a carefully-regulated, easily-digested diet; and, if unable to feed herself, should be assisted to do so. There seems to be, with few exceptions, a consensus of opinion as to the utility of arsenic in chorea. In the form of the liq. arsenicalis it should be prescribed in gradually increasing doses thrice daily until its physiological action appears, which usually occurs at the fourth week, and is attended by itching, redness of the conjunctiva, dryness of the mouth, and a slight tendency to vomiting (F. 4). The medicine is now stopped, and is taken after a week or ten days in 1-minim doses thrice daily for a fortnight. If there is evident anæmia, tinct. ferri perchlor. in 6-minim doses should be given with an arsenical solution (liquor arsenici hydrochloricus).

Another remedy is sulphate of zinc, given in doses gradually increasing from 1 or 2 grains three times a day, to 6, 8, or 10 grains, till sickness is induced, when in some cases the disease appears to be cut short. In the very severe cases the great indications are to procure rest and to keep up the strength of the patient. In such cases bromide of potassium is of very little value when given alone, but when given with chloralamide in solution as "chlorobrom" it is a most effective remedy. In a markedly violent case, where it was administered by me to a girl ten years of age, a dose of ʒi. caused rest, and a second dose of the same quantity, sleep, which lasted for eight hours. On four succeeding nights a drachm dose was sufficient to cause sleep. Arsenic was also given in the ordinary way, and in three weeks the patient was perfectly well. Other writers recommend chloral hydrate by the mouth or rectum, or antipyrin, or inhalation of chloroform, or conium. The *diet* should consist of milk, eggs, beef-tea, and other forms of fluid nourishment, with wine or brandy, if the exhaustion is great. In some cases food has to be given by the rectum.

Other affections described in Chorea.—Two forms of chronic chorea in adults are recognised—Huntington's chorea (hereditary chorea) and senile chorea. Huntington's chorea is associated with mental weakness, and with a family history of insanity. Senile chorea is not so associated. The *symptoms* in both forms are similar to those of chorea in early life, but the *course* is, however, different, for it is chronic, persistent, and progressive, and treatment can only be palliative.

Habit Spasm.—Some erroneously consider this affection a form of chorea. It usually begins between the ages of six and fourteen, and is said to be more common in females than males. It is characterised by spasmodic movements, such as winking, twitching the mouth, jerking the head, shrugging of one shoulder. These habit-movements, although they appear voluntary, are not under the control of the will. They usually occur at intervals of a few minutes, but sometimes they are almost continuous. As a rule the condition is not permanent, and after persisting for a few months or longer gradually disappears. Sometimes, however, it continues in adult life and becomes a source of great annoyance to the patient.

Treatment.—The friends of the patient should not take much notice of the symptoms, for observation or threats increase their frequency, while promises of a reward at the close of each day on which the spasm has not occurred will sometimes gradually cause their disappearance. Of drugs arsenic seems to be most beneficial, especially if it be injected hypodermically.

PARALYSIS AGITANS

Shaking Palsy.—This disease develops gradually, and attacks elderly persons of both sexes, being very rare before the thirty-fifth year. It is characterised by an insidious beginning, but when fully developed presents two marked symptoms—(1) Continuous tremor; (2) stiffness and shortening of certain muscles, consequent on which there is a series of peculiar movements.

The *tremor*, though continuous, abates in violence when the patient is quiet in mind and body, but the slightest excitement, even the knowledge of being watched, will throw the body into vehement and unrestrained action.

The *stiffness* is marked on the head and body, the head being bent on the chest and the body inclined forward, with the arms flexed at the elbow-joint, the fingers doubled into the palm of the hand, and the legs flexed at the knees. If the patient is placed in a chair he cannot get up by himself, but a little assistance enables him to do this, and when he is lifted he will move on when "set a-going," until he comes up against some object, as a wall. The inability to stop and the peculiar jog-trot style of forward movement are termed *festination.*

Etiology.—The cause of the disease is unknown. Most authorities think it is of a nervous character, others lean to the supposition that it is entirely muscular. Post-mortem examinations have revealed no definite lesion.

Diagnosis.—Paralysis agitans can only be mistaken for insular sclerosis, but the character of the tremor varies in the two affections. It is continuous and oscillatory in paralysis agitans, while in insular sclerosis it only occurs when an effort is made (intention tremor). Moreover the general features of the diseases are dissimilar.

Treatment.—Some benefit has been derived from nervine tonics, especially arsenic, and on different grounds good effects have been stated to follow on the administration of a nervine sedative, as bromide of potassium and hyoscine. As a rule treatment consists in lukewarm baths and massage of the muscles.

"WRY-NECK" OR TORTICOLLIS

There are two forms of disease known by the name of Torticollis—*fixed torticollis* or congenital wry-neck, and *spasmodic torticollis.* The former is not a disease of the nervous system; it arises from faulty development of the sterno-mastoid muscle, due to injuries during birth, and is observed first during childhood or early infancy.

SPASMODIC WRY-NECK OR TORTICOLLIS occurs chiefly at middle life in persons otherwise healthy, and is accompanied by jerking movements, sometimes limited to a single muscle, repeated at considerable intervals for a great length of time, and sometimes suddenly replaced by a similar movement of an entirely different part. At an early stage the intermissions are comparatively long, but later on they are of shorter and shorter duration until the spasms are almost continuous. The muscle most frequently affected is the sterno-mastoid, and next to that the upper part of the trapezius and the splenius capitis. The position of the head varies according to the muscles which are involved; but ultimately as the disease advances the recurring contractions turn the head away from the side which is the seat of the spasm, and it thus becomes permanently twisted.

Pathology.—The disease is not due to lesion of muscle or of nerve, but is a disturbance of the motor centres, either in the cortex of the brain or in the spinal axis, or perhaps in both situations in the same case.

The *prognosis* is very unfavourable; and in advanced cases the suffering is intense, and renders life a burden.

Treatment.—This is very unsatisfactory. Dr. Harley has found benefit from succus conii in large and increasing doses, as from ℥i. to ℥iv. in a daily dose.. Good sometimes results from bromide of potassium. A weak constant current passed continuously through the contracted muscles for five or ten minutes, causes relaxation for a time. But the benefit from its use is only temporary. Surgery in these cases does no good.

EPILEPSY OR FALLING SICKNESS,

sometimes also popularly termed "fits," is an affection of the nervous system characterised by *loss of consciousness*, with or without convulsions. The transient loss of consciousness is known as *petit mal*, the loss of consciousness with general convulsive seizures is known as *grand mal.*

In some forms of nervous diseases, as for instance in cerebral syphilis, convulsive attacks (Epileptiform convulsions) may occur, having a general resemblance to epilepsy; but these are not regarded as instances of idiopathic or true epilepsy. Localised convulsions, without loss of consciousness, generally connected with definite cerebral lesions, may also occur, and they are known as cases of Jacksonian epilepsy. *The essential element of epilepsy is loss of consciousness.*

Etiology.—The tendency to epilepsy is often hereditary, but various other causes may be mentioned. Occurring often at puberty, it is justly considered in many cases to be a lamentable corollary of masturbation, of too early and frequent sexual intercourse, of malformations of the head, of tumours, of the scrofulous diathesis, or it may be the direct result, either to himself or children, of an habitual drunkard's habits.

These are centric causes; while as eccentric sympathetic causes may be mentioned uterine derangements, irritation of teething in children, a disordered state of the stomach and intestines in males. Fright is a prominent exciting cause in a person predisposed to epilepsy. The first seizure in hereditary epilepsy occurs usually before the tenth or twelfth year in both sexes.

Symptoms.—These are best divided into what occurs before, during, and after a fit.

Warnings of various kinds may precede the attack, such as spectral illusions, confusion of thought or speech, headache, dimness of vision, or what the patient describes as the indescribable sensation of an inward working. The most curious forerunner of a fit is what is termed the "epileptic aura or vapour." It seems to come from some distant part of the body, and patients describe it creeping along, as water may trickle or a serpent crawl, until it reaches the head or stomach, when consciousness is lost in the fit; or in contradistinction to this sensory aura there may be what is termed a "motor aura," recognised by twisting or palsy of some part of the body. With or without these auræ the fit may be described in three stages.

(a) *Tonic Spasm.*—The head is drawn back and the jaws are closed. The hand is fixed at the wrist, the fingers tightly clenched in the palm, the feet extended, and the knees and hip-joint fixed. The spasm affects the muscles of the chest, respiration is impeded, and the initial paleness of the face changes to a dusky or livid hue. This stage lasts only a *few seconds* and then the

(b) *Clonic Spasms* begin. The spasms now become intermittent. The limbs are jerked and tossed about. The muscles of the face are in constant clonic spasm, the eyes roll, the eyelids are opened and closed convulsively. The movements of the jaws are forcible and strong, and it is at this time that the tongue is caught between the teeth and bitten. Saliva, frothy, sometimes mixed with blood, escapes from the mouth. The fæces and urine may be involuntarily passed. This stage rarely lasts for more than *one* or two minutes. The contractions become less violent, and the patient passes into a condition of

(c) *Coma.*—The breathing is noisy, even stertorous; the face congested, but not cyanotic. The limbs are relaxed and the unconsciousness is profound. After a *variable time* the patient can be aroused, but if left alone he sleeps for some hours and awakes with headache and a confused recollection of what has occurred. The fit is succeeded by seemingly restored health, but ultimately by other seizures, the interval between the occurrence of which varies. Usually an interval of four or five weeks elapses, and this is followed by a series of fits, occurring at short intervals. The attacks may occur during the night without the patient knowing anything about them.

Post-epileptic Symptoms are sometimes of serious moment, for it is acknowledged that an outbreak of mania may be substituted for a fit, during which the patient is often dangerous, and sometimes homicidal, and even in the trance-like condition he may perform actions of which subsequently he has no recollection. And further, though epileptic attacks are not primarily fatal, yet gradually the constitution is sapped, the mental and bodily vigour impaired, and not infrequently the unhappy victim of epilepsy ends his days in an asylum. We have described what is termed the "Grand Mal" with full paroxysms, but there is a form of epilepsy known as the "Petit Mal," in which the only characteristic sign is a loss of consciousness without any visible spasmodic effort, or at most accompanied by fixation of the eyeball. The time during which consciousness is lost is very brief, only from a few seconds to half a minute, yet in exceptional cases it may continue for three or four minutes. There is no forewarning; while eating, the patient lets his spoon or knife drop, and his look becomes fixed. Sometimes this lasts only so long as to excite the attention of those around him, then he resumes taking food. While in the midst of talking, he suddenly stops; after a short absence of mind he takes up the thread of conversation. While walking on the street he stops still, but he need not necessarily fall if the arrest of consciousness is not prolonged; but, on the other hand, if the absent-mindedness is longer, he may fall down, or, if riding, be thrown from his horse.

JACKSONIAN EPILEPSY.—This is also known as cortical, symptomatic, or partial epilepsy. Its great distinguishing characteristic is that consciousness is retained. The condition, as a rule, is due to an irritative lesion in the motor zone. In a typical attack the spasm begins in a limited muscle group of the face, arm, or leg. Prior to the twitching the patient may feel a sensation of tingling or numbness in the part affected. The spasm extends and may invade the muscles of one limb or the face. The patient is conscious throughout, and watches often with interest the march of the spasm. The spasms may be localised for years, but there is a great risk that the partial epilepsy may become general. A considerable number of the cases of Jacksonian epilepsy are found in children, following hemiplegia — the so-called post-hemiplegic epilepsy. In other cases they are due to tumours, to inflammatory softening, to acute and chronic meningitis, and trauma.

Pathology.—Should death occur during a paroxysm, the brain is found more or less congested, while, in long-standing cases, it may be softened or indurated and increased in weight. The researches of Schroeder Van der Kolk point to the medulla oblongata as the seat of the disease, that portion of the brain being supposed to be more excitable and sensitive, from an increased afflux of arterial blood, or from the accumulation in the system of some materies morbi, which leads to an explosion in the form of an epileptic fit. Hughlings Jackson and Ferrier have produced epileptiform fits in animals by galvanic stimulation of certain convolutions of the brain, which, if removed, do not cause paralysis, but yet, when stimulated, give rise to these convulsions. Hence, epilepsy seems to these authorities to be an explosive lesion, like the discharge of a battery, although "we cannot say that an excess of energy is manifested, for we must take into account the energy required for constraint, which is taken away, and thus all energy is concentrated in the abnormal convulsion."

Brown-Séquard thought that epilepsy was due to irritation of nerve-cells, which have their nutrition altered, and after a time acquire that morbid excitability which is the essence of the disease. He did not consider that it would ever be possible to recognise what cells are altered, as it is quite likely the change in them is more dynamical than physical. "That, however, the cells are located chiefly in the base of the brain," he considers, "is a conclusion borne out by many facts." At the same time he admits "that the spinal cord has a share in the production of epileptiform convulsions, and may help in producing in man an arrest of cerebral activity during a fit of epilepsy."

Treatment.—This consists of two points:—

1*st*, What to do during a convulsion, and 2*nd*, after a convulsion.

1. When the fit occurs, the head should be placed in such a position that the tongue, which is then paralysed, should

not fall back on the larynx and cover its aperture. Certain obvious duties are also necessary. The necktie should be loosened and the patient placed in such a position, with the head somewhat elevated, as to prevent his injuring himself against articles of furniture during the struggle. If it be possible, a piece of wood or india-rubber should be placed between the teeth, in order that the tongue may not be bitten. It is unnecessary to do more than what has been mentioned. Active measures do harm; the fit when begun cannot be successfully shortened, and it is thus better to wait until nature in due time recalls the patient to consciousness. It has been asserted that nitrite of amyl capsules broken and inhaled may avert an attack, and it is known that chloroform may stop it when it has occurred; but, if this is administered, the patient is left more stupid and afflicted than if the natural outburst had been allowed to take place.

2. It is impossible to get rid of certain predispositions, such as a strumous diathesis, a misshapen head, or organic lesion of the brain and spinal cord. At the same time, some eccentric causes are remediable. If due to worms, give a vermifuge. If a syphilitic history exists, iodide of potassium and the bichloride of mercury are serviceable. If dependent on vicious habits, the patient must be warned against these. The system should also be braced up by good air, cheerful society, and the shower-bath, the latter being used only if it produce a genial glow of warmth.

There seems to be a consensus of opinion as to the benefit to be derived from the use of bromide of potassium. Some prefer to give the drug alone, but others consider it better to combine it with bromide of ammonium or sodium (F. 69, 70*a*), or with bromide of ammonium, iodide of potassium, and tincture of calumba (F. 71*b*). Undoubtedly Brown-Séquard's mixture of the bromides answers well, when systematically given. Sleepiness during the day occasioned by its use may be minimised by giving a teaspoonful dose thrice daily about an hour after food, to avoid the occasional irritative effect on the gastric mucous membrane; while the maximum dose should be given at bedtime. The production of bromism evidenced by mental torpor, drowsiness, and bodily weakness is not desirable. The development of acne may be averted by giving each dose diluted with alkaline waters, and by administering from time to time full doses of liquor arsenicalis. The bromide treatment should be continued for two or three years after the convulsive attacks have ceased, in the following manner. After a year of freedom from attacks, give the bromides only six days in the week; after fifteen months, only five days in the week; after eighteen months, only four days in the week; and at the end of two years, only three days in the week.

If we exclude cases dependent on injuries or deformities of the skull, or caused by dentition, or the result of syphilis, we may, by adopting this treatment, confidently expect favourable results in most cases of epilepsy. But in carrying it out we must act in no haphazard manner, but with an assured trust in its efficacy, for this engenders corresponding hopefulness in the patient, and the ready acquiescence of his friends in obeying our instructions as to the regular administration of the medicine. When the aura is very definite and constant in its onset, as from the hand or the toe, a blister about the part, or a ligature tightly applied, may stop an impending attack. In nocturnal epilepsy the daily doses should be diminished to 30 m., and 50 to 60 grains of bromide of potassium should be given an hour or two before bedtime, combined with 5 to 10 minims of tincture of belladonna.

A gentle purge, as pulv. rhei co., every four weeks, gives a new impetus to the usefulness of the bromide treatment. Treatment by electricity, though commenced hopefully, has failed; so also setons introduced into the nape of the neck have not succeeded in producing any improvement. Of specific remedies we may mention those which have been chiefly advocated—viz. valerian, worm-seed (radix artemisiæ), atropine, hyoscyamus, inhalations of chloroform, ammonio-sulphate of copper, nitrate of silver, and oxide of zinc. The latter—the oxide of zinc—is certainly an efficacious remedy in epilepsy occurring before the twentieth year, given in $\frac{1}{2}$-grain dose three times a day, and increasing gradually up to 2 or 3 grains. If begun it should be continued for some months, as considerable time elapses before improvement is evinced. An old anti-epileptic powder consisted of valerian, belladonna, and oxide of zinc. Borax has also been recommended when the bromides are not well borne, and it is given in 10-grain doses at first and increased up to 80 or 90 grains daily, mixed with a little glycerin, syrup, and water. The drawbacks to its employment, nausea and vomiting, may be prevented by giving $\frac{1}{4}$ gr. of cocaine hydrochlorate a quarter of an hour before the borax.

Surgical Treatment.—The treatment of Jacksonian epilepsy is surgical, and the propriety of surgical interference has been brilliantly and successfully demonstrated by MacEwen and Horsley. In idiopathic epilepsy, when the fit starts in a certain region—the thumb, for instance—and the signal symptom is invariable, the centre controlling this part may be removed. In traumatic epilepsy, in which the fits follow a fracture, the results accruing from an operation are remarkable. In the epilepsy following hemiplegia, from the anatomical conditions of the affected part of the brain, surgical interference seems to be indefensible.

Dry-cupping, the actual cautery applied so as to produce a white line, and anæsthetising the terminal nerve-fibres whence the aura originates, have been recommended as external remedies in addition to those already spoken of.

Dietetics.—Stimulants, tea, and coffee must be entirely forbidden to epileptics, or—in case this is for any reason impossible—should be allowed only in the very smallest quantities. Generally speaking, there should be abstinence from animal food, and life should be sustained by a vegetable and milk diet. No hard-and-fast line can, however, be laid down, and we must be guided in part by individual peculiarities and the observations made by patients on themselves. A sedentary indoor life is not to be recommended, but one which necessitates light work out of doors, as gardening. Light reading and the avoidance of emotional stories are essential adjuvants to treatment; for it has by experience been proved that to forbid mental work entirely is seriously detrimental to the best interests of the epileptic.

TETANY.—Tetany is a neurosis occurring either as a primary affection, or in association with other pathological conditions, as dilatation of the stomach, pregnancy, over-lactation, worms, etc. It has been noted after excision of the thyroid. In children it seems usually to have a rachitic basis, and is often associated with laryngismus stridulus. The condition manifests itself in recurrent tonic spasms, chiefly of the upper extremities. As a rule the spasms are bilateral. The lower extremities may be affected; more rarely the trunk. The attack commences in the fingers, and the hand becomes cone-shaped. The fingers are extended as if to hold a pen, but the thumb is firmly pressed into the palm. The feet become arched. The facial muscles may become stiff. The stiffness lasts as a rule only a few minutes, more rarely it may extend over some days. During the attack the nerves are in a state of increased excitability both to mechanical and electrical stimuli. Trousseau found that pressure on the motor nerves or over the blood-vessels, so as to hinder the circulation, reproduces a paroxysm. The mind remains unaffected to the end.

The prognosis depends on etiology. It is bad if due to dilated stomach. Treatment is symptomatic. The continuous current, antipyrin, phenacetin, are sometimes useful during the attack. In the intervals hyoscine is recommended.

INFANTILE CONVULSIONS (Eclampsia Infantum).—The "teething convulsions" of children are by no means uncommon in the families of the poor, especially during the first dentition, and when the cutting of the teeth is difficult. "Convulsions from worms" are also well known. Intestinal disorders, as diarrhœa or undigested food, may act as exciting causes, especially if the child is rickety. An inherited neurotic tendency is a most important predisposing cause. In children convulsions may occur at the commencement of specific fevers, as scarlatina, measles, and pneumonia.

Symptoms.—The convulsions either commence suddenly, or there may be warnings. These warnings are diarrhœa, painfulness of the gums, symptoms of worms; or they may be more immediately connected with the nervous system, as evidenced by disturbed sleep, crossness and fretfulness, rolling of the globe of the eye, or bending in of the fingers. During the convulsions the symptoms are similar to those of epileptic paroxysms. The child's eyes become staring and fixed, and there are spasms tonic and clonic of the face, trunk, and extremities. The child may die in one of these convulsions, or the seizures may continue for some days with short intermissions, or the child may, after the first attack is over, be perfectly free from them.

Treatment.—Lance swollen gums, and remove stomach contents by an emetic, or give an enema. Then put the child in a bath at a temperature of 90° to 95° F., and when in the bath apply cool water to the head. If diarrhœa exists, an enema or bath is unnecessary, but an injection of chloral and bromide of potassium proves singularly valuable in a short time. If more rapid action seems desirable from the violence and frequency of the fits, a dessertspoonful of chloroform should be poured on a handkerchief, and cautiously administered by inhalation.

VERTIGO.—*Variety*, Auditory; *Synonym*, Ménière's Disease.

By Ménière's disease is meant a group of phenomena, to which attention was first directed by Ménière in 1861, including sudden giddiness, staggering gait or tendency to fall on one side, vomiting, noises in the ear and deafness on one or both sides—symptoms simulating intracranial disease. The deafness and noises in the ear usually remain permanent, while the other symptoms occur in paroxysms ending in gastric disturbance, nausea, and sweating. On account of the giddiness and the tendency to fall on one side, Ménière believed that the cause of the phenomena in this disease was some morbid change in the semicircular canals. He based this explanation on the well-known experiments of Flourens, which pointed to that part of the inner ear as the organ which controls the equilibrium of the body. Ménière's disease is sometimes designated "labyrinthine vertigo," from the supposed seat of the symptoms. It has, however, been pointed out by aural surgeons, such as the famous von Tröltsch, that the phenomena of this disease may arise from morbid conditions in the external auditory canal and the middle ear, especially from any pathological condition which leads to abnormal pressure on the labyrinthine fluid, such as undue pressure of the stapes on the membrane which closes in the *fenestra ovalis.* It is very probable, however, that the phenomena of Ménière's disease are sometimes due to a sudden change in the condition of the parts contained in the semicircular canals.

If the seat of the symptoms is not in the peripheral parts of the ear, the treatment is usually very unsatisfactory. Large doses of bromide of potassium have been recommended and should be tried. Gowers has used salicylate of sodium and gelsemium with good results.

NEURALGIA

This is a term applied to a disease of the nervous sensory apparatus, marked by paroxysmal pain, which is for the most part unilateral and in the course of the nerves. The pain in neuralgia is characterised generally by certain "tender points," pressure on which distinctly increases it. The onset is preceded by some little numbness and is followed by a darting pain, which at first is not severe, and ceases quickly, but returns shortly, lasts for a short time, and then remits. These darts revive with shorter and shorter intervals so that the pain appears almost continuous or interrupted by waves of intensity, and it will last for some seconds or more than a minute together. Then comes a respite to be followed by recurrence, and these alternations may continue for a few minutes or as many hours.

Local Varieties.—The varieties of neuralgia are divided into two primary groups, namely :—

I. Superficial ; II. Visceral.

1. *Superficial.*—These include cervico-occipital, cervico-brachial, intercostal, lumbo-abdominal, crural, the last two being not common. The most typical and common example of superficial neuralgia is *neuralgia* of the *fifth nerve, trifacial* or *trigeminal neuralgia, Tic Douloureux.*

One alone, more often two, but rarely all the three divisions of the fifth nerve of one side may be attacked at the same time. It is less common for the third division to suffer than the first and second.

Etiology.—It is more apt to attack females than males during adult life. In women, utero-gestation, the exhaustion from hæmorrhage at parturition, menorrhagia or over-suckling, as well as the change in middle life, are especially prone to reproduce facial neuralgia.

Symptoms.—When the *first* division is affected the pain is over the forehead, the anterior half of the scalp, the eyelid, eye and side of the nose. The term "brow-ague" is still frequently applied to the attack of the first division of the nerve. Tender points are found at the supra-orbital notch, at the outer side of the eyelid, at the side of the nose, and sometimes there is an *ocular* point within the eyeball.

If the *second* division is attacked, the pain extends over the cheek, between the orbit and the mouth, and to the ala of the nose. Tender points are found at the site of the emergence of the infra-orbital nerve, over the malar bone, or on the gum of the upper jaw.

If the *third* division is attacked, the pain spreads over the parietal eminence, the ear, the temple, the lower jaw, and the tongue. The tender points are on the temple, a little in front of the ear, at the place of exit of the inferior dental nerve, at the side of the tip of the tongue, or more rarely in the lower lip.

2. *Visceral.*—(a) *Cardiac.* Under the influence of fatigue or strong emotion, there may be sudden severe pain at the lower end of the sternum darting to the back and down the left arm, or it may be diffused over the chest and affect both sides. Such attacks may occur only once or twice, but there may be a constant tendency to them, under circumstances of extreme excitement.

(b) *Uterine* and *ovarian neuralgia*, and (c) *abdominal neuralgia* are not uncommon.

(d) The *uretha*, *bladder*, *rectum*, *kidney*, and *testis* may each be affected by neuralgia.

Treatment.—The rational treatment of neuralgia consists first in the relief of the symptom, pain; and secondly, in the removal of its cause. The means by which these ends are to be secured are—by attention to the general health, by drugs given internally or applied externally, by certain surgical operations on the nerves.

The general health in neuralgia is generally below par, and hence the necessity of fresh air, rest, nutritious food, and alcohol in a small quantity with meals. Animal food is of great importance for all but gouty subjects. Cod-liver oil does good when readily assimilated. Iron, when there is anæmia, is a potent therapeutic agent. Quinine, in a full dose before the expected attack, is serviceable, and whenever the nervous system is feeble nux vomica or strychnine may be added with advantage to other remedies that are given. Arsenic is occasionally useful. In syphilitic forms, mercury and iodide of potassium should be given.

Analgesics are important agents in the treatment of the disease. In some cases marked relief is afforded, especially in facial neuralgia, by antipyrin, exalgin, and phenacetin. Chloral in the same affection does little good, but butyl-chloral hydrate is a more reliable remedy when given in a dose of 3 grains, every two hours, dissolved in 20 m. of glycerin and ℥ss. of aqua aurantii, or in combination with 10 m. of tincture of gelsemium. If after four doses of butyl-chloral hydrate no benefit is obtained, its use should not be continued. When the pain is very severe a hypodermic injection of tabloids of morphine $\frac{1}{12}$ grain and atropine $\frac{1}{250}$ grain should be made over the seat of pain, or these alkaloids may be taken internally. In gouty or rheumatic forms salicylate of sodium in doses of 20 or 30 grains twice daily or in combination with antipyrin often acts like a charm (F. 5*a*). A local injection of $\frac{1}{12}$ grain of cocaine often relieves pain when it is superficial and is accompanied by tenderness. The local injection of a 1% solution of carbolic or osmic acid has been favourably spoken of, and electricity by the careful application of the constant current is an agent of value.

Relief in slight cases is obtained by lin. opii, lin. chloroformi, and lin. belladonnæ (F. 57), or by menthol 3, chloroform 4, olive oil 8 to 16 parts. In more severe cases the application of a piece the size of a bean of unguent. aconitinæ has been found useful, and in all forms of neuralgia considerable relief may be obtained by the use of small blisters (size of a florin) applied in the neighbourhood of the principal focus of pain, one following another at intervals of two days, not on, but near, the already blistered surface.

Surgical Treatment.—In certain cases of persistent trifacial neuralgia when by other means the suffering cannot be relieved, excision of a short piece of the trunk of the nerve, to the distribution of which the pain is referred, has been tried with some permanent success. Nerve-stretching and simple division have also been attended with relief of pain for a time, but it is not lasting.

HEADACHE is a symptom occurring in the course of a great variety of diseases, dependent on very different factors. It is significant of fever. It precedes catarrh, and constitutes a leading diagnostic symptom of acute meningitis, tumour, and abscess of the brain. It generally appears before and invariably follows on an epileptic seizure, and sometimes foretells an attack of cerebral congestion or cerebral hæmorrhage. It may result from the state of the blood in chronic alcoholism, uræmia, secondary syphilis, and diabetes. A plethoric headache, a bilious headache, accidental or habitual, and a rheumatic headache are also recognised, but their nature and symptoms can be readily distinguished from migraine, to which we shall now refer.

MIGRAINE (*Synonyms*, Megrim, Sick headache, Sick giddiness, Hemiopia, Hemicrania). Migraine consists essentially of paroxysms of unilateral headache accompanied by disordered vision. To such cases the name of Hemicrania (ἡμικρανία) has been applied since the days of the old Greek writers, and that word has undergone corruption into the French *migraine* and the English *megrim.*

The leading symptom in migraine is pain, which commonly begins at some one spot in the forehead or temple, and gradually spreads all over these regions. It is sometimes preceded by indistinct vision or a tingling sensation in the limbs, face, tongue, or other parts. The pain is more dull and sickening than that of neuralgia, and it is aggravated by exposure of the eyes to light, by every noise heard, and by every movement of the body, especially the head. Thus the great desire of the patient is to be let alone, to lie still in a darkened room and not to be spoken to. In severe cases even lying down on a bed or sofa or reclining in an easy-chair is so intolerable that the patient is obliged to get up and move about. The beats of the heart are in such cases reduced sometimes to fifty-two or even forty-eight per minute. The hands and feet are cold, yet the head feels hot, and while the radial artery is small and contracted, the carotid is full and throbbing. In this distended throbbing carotid we have a clue to the nature of the affection, but the interpretation is twofold.

(*a*) The sensory phenomena are due to an implication of the vaso-motor system of nerves on the affected side, which leads first to contraction of the vessels and anæmia of the brain, and secondly to dilatation and hyperæmia consequent upon exhaustion of the vaso-motor apparatus.

(*b*) The sympathetic disturbances are secondary phenomena, the primary change being a disturbance of the cells of the cerebral cortex, which disturbance is one of continued inhibition and discharge.

The duration of a severe attack is usually several hours. It is often hereditary, and females are more subject to it than males. It rarely commences after thirty, and subsides with the advance of years.

Treatment.—In migraine the patient should be allowed to remain in a darkened room, and not be troubled with anxious inquiries or attentions, which only make the condition worse.

The REMEDIES chiefly used during the attack are tinct. guaranæ, m. xxx.; granular effervescent citrate of caffeine, gr. xxx.; salicylate of sodium, gr. xxx.; antipyrin, gr. xx.; tincture of cannabis indica, m. x.; bromide of potassium, gr. xxx.; nitrite of sodium, two parts in 120 of water—dose, a teaspoonful. Strong tea or coffee often gives relief, and pressure on the carotid or temporal artery of the side affected may command for a time the pain.

The GENERAL TREATMENT consists in a change of air by a sea-voyage or residence at a high altitude, in the avoidance of all mental worry, and in correcting derangements of digestion.

In the other cases of headache referred to it is essential to attend to the primæ viæ, and to secure regular motions by appropriate diet or medicine. A useful aperient in slight cases is pulv. rhei co., of which 60 grains may be occasionally taken.

When PLETHORA exists a more active purgative is required, as calomel 4 grains in the evening, followed by a black draught (mist. sennæ co.) in the morning, and afterwards an aromatic tonic (F. 79*a*). The general principles of diet are indicated under Obesity, p. 341.

The *habitual bilious headache* is very difficult to treat satisfactorily, but most reliance is to be placed in the use for some time of podophyllum or euonymin until regularity of the bowels is established, and afterwards prescribing Easton's syrup. The *rheumatic* headache is as a rule controlled by salicylate of sodium during the day and by a hypnotic at night.

HYSTERIA

This term is misleading, being derived from ὑστέρα, the womb, thus indicating that the womb is primarily affected, and implying the exemption of the male sex from its influence. We know that these conditions are not absolute, for the womb is not necessarily in a morbid condition, and the male sex is subject, though only exceptionally, to hysteria. The term "hysteria" must, however, be retained, as it is identified with the literature of medicine, and it would be difficult to find any name which would exactly include the phenomena of the disease subsequently to be mentioned.

In hysteria there appears to be no definite alteration of structure in the nervous system, though this is simulated in many instances. It would appear that partial or complete suspension of the inhibitory influence is the main fact in the symptoms of hysteria, mental and physical. A laugh in a condition of health goes no farther than the will can control it, but in hysterical people a laugh may end in tears or shouts, or even in spasms and convulsions. It ripples into other nervous centres which are normally exempt from its exciting influence.

Hysterical paralysis indicates that the power of the higher centres in originating movement is in abeyance. Hysterical anæsthesia is due to lack of feeling or sensory impression, and hysterical hyperæsthesia and pain seem to be connected with the sensory ganglia which are morbidly excitable, and are not, as in ordinary states, dependent on the peripheral nerves.

Etiology.—The female is more prone to hysteria than the male, and there is some ground for believing that hereditary predisposition exists in many cases.

Hysteria usually occurs between fifteen and thirty—most frequently between fifteen and twenty. Often luxury, enforced chastity with prurient desires and thoughts engendered by light reading, unnatural desires, and unfortunate marriages, seem to evoke hysterical symptoms. Want of sleep from prolonged nursing of a sick relative is often a prominent factor. Hysterical symptoms seem to reach their acme, as in neuralgia and epilepsy, when the menstrual period approaches.

Symptoms.—The symptoms of hysteria may be grouped under (1) mental, (2) sensory, (3) motor, (4) circulatory, (5) visceral.

Mental.—There may be apparently increased mental power, but, if so, it lacks the firm control usually associated with higher cerebral development. The emotions predominating are often of an incongruous and ludicrous character. A pathetic story may evoke laughter; a ridiculous and amusing anecdote may cause tears. Common-sense and prudence are absent, and an intense longing for the sympathy of others is a pronounced phenomenon. Unfortunately, there is often a mental twist which leads to deception and untruthfulness.

Sensory.—Hysterical pain and tenderness are seen in different situations of the body. They may simulate intercostal neuralgia, usually of the left side. They may appear to be due to a serious spinal disease affecting the cervical and upper dorsal region. They may settle in a joint, as the knee, and produce manifest and excruciating agony, resembling acute synovitis. They may reside in the mamma, and have the darting symptoms of cancer. They may attack the head, and excite suspicion of a cerebral tumour.

Epigastric and iliac tenderness are prominent phenomena in hysterical patients, while anæsthesia rarely affects the whole body, but usually is limited to one side, generally the left. This anæsthesia may be confined to the surface, or it may be deep-seated, and pain is not experienced when pins are driven into the muscles.

The disorders of sensation in hysteria may, broadly speaking, be distinguished from organic disease by the fact that they are unstable, their appearance and departure depending on no fixed rule, and that they are apt to ensue on some worry or mental shock.

Motor.—Spasm, convulsion, and paralysis are the chief motor phenomena. The *globus hystericus* is perhaps the most constant sign of the disease. This feeling is described by hysterical patients as akin to choking, and is likened to an egg filling up the throat. It is often followed by a burst of tears.

Spasms affect various muscles connected with respiration. A cough, sharp and ringing, unaccompanied by expectoration, is seen to be developed when the patient is NOT alone, and when sympathy with her condition may be manifested. The expiratory spasm may be evinced by laughing and crying, or by yawning, hiccough, and sneezing.

Spasms, clonic and tonic, of limbs may occur, and may sometimes resist even the inhalation of chloroform. But faradisation, continued for some minutes, settles all doubts if applied to an hysterical contraction or a phantom tumour, for this exhausts muscular contractility, and, *nolens volens*, the ailment is cured.

Convulsive seizures are frequent, and simulate epileptic fits. It will be noticed, however, that the face in hysteria is more or less red, that the fall is always chosen so as to avoid positions of danger, and that the cry is not a "wailing shriek" like that of epilepsy, but a confused medley of choking, with much gesticulation. The tongue also is not bitten, and the deep sleep of epilepsy does not supervene on the attack, for the hysterical patient may in a few seconds recur to her former condition.

There is no incontinence of urine during a fit of a hysteroid character, though there may be a copious flow of clear urine at the termination of the seizure.

Paralysis may affect any limb, but paraplegia is the usual form. The muscles retain their nutrition, and in most of the cases there is no history of antecedent convulsions. The irritability to induced currents is also normal, although there may be at first an apparent slight loss.

Circulatory.—Syncope may develop and simulate death, for occasionally the pulse is imperceptible, the patient being speechless and apparently unconscious. Recovery, aided by the inhalation of ammonia, occurs, accompanied by profound sighing.

Visceral.—Vomiting is a frequent symptom, and may last for some months, without, however, any great loss of weight or sensible malnutrition. Noisy flatulence in the intestines is common, and retention of urine may be observed, or there may be an undue desire to empty the bladder regardless of appearances or proprieties.

Prognosis.—The prognosis, so far as life is concerned, is always favourable, but the disease, if maltreated by too much sympathy and attention, may last for a length of time. As a rule, with some few exceptions, the hysterical phenomena, of whatever type, cease with the end of the climacteric period.

Treatment.—The patient's surroundings must be carefully considered when the disease is fully diagnosed, and removal from home and a residence among strangers are always attended with benefit. Certain medicinal agents have undoubted value.

Thus, the inhalation of ammonia is a well-known and worthy remedy to avert an attack, and so also is a teaspoonful of ether. For continued treatment valerian in powder or tincture has a manifest effect, and the aloes and asafœtida pill (B.P.) has an established reputation. In hysteria with anæmia, iron is indicated, and the scale preparations are preferred as causing less disorder of the digestive powers.

Strong induced currents are useful in anæsthesia and paralysis, and there can be little doubt that hysterical convulsions are effectively mastered by douching the patient with cold water. For a few seconds the water may seem to have no effect, but this condition is invariably succeeded by gasping, and the patient's movements or words indicate she does not desire to have the experiment continued. In many cases the remembrance of the treatment may prevent a repetition of the convulsions. The douche seems to act by the medium of the cutaneous nerves, and, by its action upon the ganglionic nerve-cells, to change the character of the blood-circulation.

Charcot recommends moral treatment in the form of isolation. Young persons, whether male or female, should be separated from their parents, and placed under the care of experienced and firm nurses, and only at occasional intervals (when amendment is progressing) should they be allowed to see friends for a short time as a reward for good conduct. This isolation is supplemented by the Weir Mitchell treatment, which consists in the combination of several factors, namely, (1) rest; (2) isolation; (3) systematic feeding; (4) massage; (5) electricity. For six or eight weeks the patient is confined to bed, isolated from sympathetic friends, and placed under the charge of an experienced nurse, who is bright and cheerful, and possesses firmness and tact. During the first week the diet should consist of skimmed milk, slightly warmed, the quantity taken daily being two quarts, and divided so that two or three ounces are drunk every two hours. Afterwards more nutritious diet is given, as gruel, chicken soup, or light puddings.

Massage more than supplies the want of exercise, tissue-metamorphosis becomes rapid and waste products are more effectually eliminated.

The electrical treatment consists in the use of the constant current.

The return to the ordinary ways of life must be very gradual, and in many cases a sea-voyage does much to confirm the cure.

CATALEPSY (κατάληψις, a seizure).—Much speculation and little definite knowledge have been the result of observation and reasoning on cases of catalepsy, and all that can be safely said is that it seems to be a neurosis midway between epilepsy and hysteria. Indeed some regard it only as a peculiar type of a hysterical paroxysm. It may occur at any age in either sex, but it is much more common in females than males at the age of puberty.

Symptoms.—Preceded, it may be, by headache and giddiness, or simply by a feeling of nervous exhaustion, the cataleptic seizure deprives the patient of consciousness, and she remains fixed in whatever position she occupied at the commencement of the fit. The eyelids may remain open or shut, and the pupils may contract under the influence of light. The great peculiarity of a cataleptic seizure is that during its continuance, which may be minutes or hours, the muscles become plastic and wax-like, and the limbs retain any position in which they are placed. Thus, if sitting, the arms may be put at any angle to the trunk, or if in bed the spine may be bent upon the pelvis so as to form an obtuse angle with the thighs. Hence the name *flexibilitas cerea.*

The *prognosis* is favourable.

Treatment.—Attempts may be made by external stimulation to rouse consciousness, and for this purpose ammonia may be applied to the nostrils and sinapisms to the limbs. These stimulants generally fail, but often a pinch of snuff may restore sensibility; if it does not, faradisation may be tried, which usually succeeds. In very obstinate cases apomorphine in $\frac{1}{12}$ of a grain dose may be injected, and the vomiting induced may terminate the attack. During the intervals, iron, antispasmodics, and cold baths should be trusted to, and the patient should be removed from all local influences which seem to favour the attack. Hence a change of air and scene is an almost absolute necessity.

NEURASTHENIA.—Neurasthenia, or nervous weakness, is capable of assuming various forms. In some cases the entire nervous system is more or less affected, in others the brain, and in others still the functions of the cord.

Etiology.—A predisposition to this affection is most common to males, in youth or middle age, who belong to the upper classes, and whose family history is neuropathic. Other acquired causes are excessive mental efforts, abuse of tobacco, tea, or morphia, infectious diseases, especially influenza, sexual excesses, and great muscular exertions, as long marches or mountain-climbing. The injury is most distinct when several of these causes coexist, *e.g.* great mental and bodily overwork, with disturbance of nightly rest; or when amid great mental overwork sexual excesses are indulged in.

Symptoms.—1. Motor disturbances, principally consisting of a striking weakness and rapid fatigue of the lower extremities.

2. Variety of disturbances of the sensory area, *e.g.* a peculiar pain in the back, evidenced when the spinal column is bent forward or backward; slight shooting or tearing pains in the district of certain nerves in the extremities; slight numbness in connection with cold feet. Disturbances of sexual functions are manifested—"Post coitum animal triste est"—and in neurasthenia this is exaggerated so that there is remarkable prostration, with half slumber and profuse perspiration. The functions of the bladder are normal. The objective symptoms are negative. There is no trace of disturbance of motion; the patient stands on one foot, and can walk perfectly with closed eyes, only the power of endurance in muscular action is weakened. There is no disturbance of sensibility, no sensitiveness over the spinous processes, no atrophy, no change of electrical reaction, no weakening of reflex action. The only distinct symptom is a wearied, suffering, anxious expression. In the condition of neurasthenia affecting the spine, termed "spinal irritation," as a rule there are two distinct areas of tenderness from the seventh cervical to the third dorsal and the eighth dorsal to the second lumbar. It is observed more often in females than males, at ages from fifteen to twenty-five. Pain radiating down the limbs, numbness or tingling are experienced, and many forms of perverted sensibility arise.

Treatment.—Gain the confidence of the patient, and when this is done forbid the excessive claims on the nervous system, and interpose a period of absolute rest from hurtful occupation or pernicious habits. Of plans of treatment for the direct relief of the disease, well-regulated hydropathy takes a foremost place, as sitz baths, tepid at first and gradually made colder; rubbing the back with partly-warmed water, and avoiding the douche and very cold applications. Mountain air and exercise, without fatigue, are also beneficial; so also is the electric current, not too strong, in the ascending direction, with change of position of the electrodes. Of drugs, the preparations of strychnine or nux vomica in small doses, or of iron and quinine, or glycero-phosphate of lime, per os or subcutaneously, give the most satisfactory results. In the "spinal irritation" form the Weir Mitchell treatment is most serviceable.

TRAUMATIC NEUROSES.—Any form of bodily or mental shock may give rise to the symptoms to be mentioned, but their comparatively frequent occurrence after railway accidents, and actions for damages ensuing, have led to the morbid condition being termed "Railway Spine," "Railway Brain," or "Concussion of the Spine." The symptoms are various, and do not follow any recognised sequence with regard to the time of their appearance or their continuance. If the shock experienced affects the brain as well as the spine the symptoms are sudden and severe, with loss of consciousness, paralysis, collapse; and such a case may end fatally in a few hours. But in other cases the brain, if affected at all, recovers rapidly, and consciousness is not lost, neither is there any distinct collapse. Subsequently, however, to the accident, at varying intervals, general weakness develops, especially in the extremities, and walking soon fatigues. There is also a complaint of numbness over various parts of the body, and the vertebral column may be sensitive to pressure. The reflexes are often not normal, but they differ so much in individual cases that no direct definite guidance can be obtained from their responses. The great feature about such cases is nervous irritability, depression of spirits, loss of memory, dizziness, and inability for mental work. Most cases, with rest, tend to recovery in months, or sometimes longer periods. Others do not get better, but gradually assume the type of severe spinal disease, as chronic myelitis, which leads to a fatal termination.

Treatment.—In treating the main symptom—the shock—it is necessary to place the body in an easy position and wait events. But if the pulse be weak and respiration imperfect, stimulants, as ether, coffee, or alcohol, must be given; while cutaneous irritants, as mustard or turpentine, should be used. If the patient recovers and spinal symptoms come on, then rest is essential, with cold sponging of the spine. If the symptoms of active mischief seem past, strychnine should be prescribed in small doses, and its action carefully watched.

OCCUPATION NEUROSES.—Occupation Neuroses result from the constant repetition of a particular action, on attempting to perform which, disturbance of function, usually of a spasmodic, rarely of a paralytic nature, becomes evident in the muscles involved. The same muscles can perform other actions normally. The most common form is Writer's Cramp or Scrivener's Palsy among clerks and those who are constantly using their pens. Other forms are met with in pianists, telegraph operators, cigarette-makers, milkmaids, etc.

Symptoms.—Writer's cramp comes on gradually: it may be felt at first as some degree of aching or strain, which is relieved by ceasing to write. After a time the act of writing is accompanied by a spasmodic tonic contraction of the finger or thumb holding the pen; the finger is pressed firmly on the pen, or it is flexed so as to move up the pen, or it slips off the pen so that the latter is grasped between the fore and middle fingers. The thumb may be similarly affected. The attempt to continue writing under such circumstances produces a cramped irregular writing: the down strokes are too thick, the point of the pen may be driven through the paper, and in its irregularity of form and force the writing "resembles that done in a railway carriage." This is the *spasmodic* or *spastic* form, and is by far the most common; but sometimes there are sensory symptoms alone or combined with motor symptoms. The sensory symptoms are distressing fatigue in the hand, and occasionally a tingling sensation of "pins and needles" felt in certain fingers during the attempt to write.

The *course* of the disease is variable. In slight cases treated at once by rest from writing the patient recovers completely, but if he perseveres, forcing himself to write by steadying his hand with the other, or by mechanical contrivances, the disease may never be quite cured.

Treatment.—Half measures are of no avail. Complete rest from writing is essential, and in mild cases this is sufficient in the course of two months to effect a cure. When writing is resumed Dr. Gowers insists that writing should be done from the shoulder. The hand should grasp the pen lightly and move as a whole. The object to be aimed at is "to write in such a manner that it shall be easy to form a line of words without once lifting the pen from the paper." In more severe cases a much longer rest is required, and if writing is necessary to the patient he may learn to write with the left hand, or use a type-writer. Small doses of strychnine, the constant current, massage, gymnastic movements of the hand, aid recovery.

HYPOCHONDRIASIS is a form of mental unsoundness characterised by morbid anxiety, either without any, or having only very slight foundations, relative to the state of physical health. The patient thinks about his health unduly, observing himself with restless care, examining especially the characteristics of his secretions, magnifying any trivial deviation from health as indicating a serious disease. "Nothing that happens tends to the side of reassurance. Constipation signifies obstruction; diarrhœa implies coming exhaustion; brain fatigue indicates cerebral softening." He is addicted to reading medical works, and is often well versed in the symptoms and diagnosis of an ailment from which he supposes he is suffering. Sometimes he sticks to one particular organ as the cause of his illness, at other times he varies the organ. He delights in consulting medical men, and with great prolixity tells the most minute details of his symptoms and his habits. He very seldom abides by any advice which may be given to him.

Prognosis.—A few cases drift into melancholia, but in the majority of cases a hypochondriac is only harmless, aimless, selfish, and lives to a good old age.

Treatment.—Ridicule of the patient's sufferings is rarely of any service; the ailments must not be ignored; and disorders, especially of the digestive system, should be rectified by suitable means. Special attention should be given to correct constipation, to enjoin exercise, to awaken an interest in life by encouraging him to undertake the duties of some useful work, and to forbid him to associate with those who are either mentally or physically weak.

RAYNAUD'S DISEASE (*Synonym*, Symmetrical Gangrene).—This is a vascular disorder, probably dependent upon vasomotor influences, characterised by three grades of intensity: (*a*) local syncope, (*b*) local asphyxia, (*c*) local or symmetrical gangrene. The stage of LOCAL SYNCOPE is accompanied by coldness and pallor of some portion of the extremities. It is analogous to that produced by great cold, and is popularly known as the "dead finger." The pallor lasts usually not more than an hour or so; then a reaction occurs, and the fingers and toes get burning hot and red.

LOCAL ASPHYXIA usually follows local syncope, but it may come on independently. The same parts, sometimes the ears, become not only cold but more or less cyanotic: they assume a bluish-black tint as though stained with ink. Attacks of this kind may recur for years, and be brought on by exposure to cold, or in consequence of mental disturbances.

LOCAL OR SYMMETRICAL GANGRENE.—The local asphyxia persists in the fingers, actual mortification sets in, a line of demarcation gradually shows itself, and a portion of one or more of the fingers sloughs away. Raynaud showed that the various symptoms are to be ascribed to a spasmodic contraction of the arteries and arterioles. This disease may occur at any period of life. It is especially common among young children and in females between the ages of eighteen and thirty. In the latter cases an unstable equilibrium of the nervous system is a potent factor.

Intermittent hæmoglobinuria in a considerable number of cases is associated with symmetrical gangrene, and in others various skin affections, as patches of subcutaneous mottling, marbling of the surface, wheals or chilblains, or well-marked scleroderma, or cerebral symptoms as epilepsy, occur.

Prognosis.—Many cases recover. Death is rare as a direct result of the gangrene.

Treatment.—Raynaud had good results from galvanism in the less severe forms, applied from ten minutes to a quarter of an hour daily. Patients suffering from paroxysmal attacks of any stage of this disease should be as far as possible protected from cold, by having the extremities swathed in cotton wool, and enveloped in flannel. In very severe cases they should keep their beds. When pain is severe a subcutaneous injection of morphine and atropine gives relief.

Progressive Facial Hæmiatrophy.—This extremely rare disease affects chiefly females, and commences before the twenty-fifth year of life. It is characterised by a chronic loss of substance in one side of the face, generally the left, beginning in the external soft parts and passing to the deeper tissues. The cutaneous secretion is diminished or wholly arrested on the atrophied parts. Though the vault of the palate, the soft palate, the uvula, and the tongue on the affected side are diminished in size, yet the functions of sense and taste are not impaired. The course is slow and protracted, and no permanent arrest to its progress follows on any mode of treatment.

Disorders of Sleep—Insomnia.—The amount of sleep varies at different ages, as the following table shows :—

Up to 10 years, children usually sleep for 14 or at least 12 hours.
From 10 to 15 the duration of sleep varies from 10 to 12 hours.
,, 15 to 25 it should not be below 8 hours.
,, 25 to 50 it may fall to 7 ,,
After 50 the sleep varies from 7 to 6 ,,

Sleep may be either excessive or defective, and wakefulness, if prolonged, may end in a grave condition—insomnia. This condition is associated frequently with great grief, mental anxiety, overwork, or it may be the result of excessive pain or the abuse of alcohol.

Byron stated that healthy sleep consisted in being lulled by the waves of the ocean, and awakened by the songs of birds. This Utopia cannot be attained, for in this busy age, with much bustle and worry, sleeplessness is often a marked symptom, either in males or females, at the ages of forty to fifty. In the former it may lead to insomnia, in the latter to a restless, fidgety state, which prevents all natural repose.

Treatment.—The treatment of sleeplessness requires firmness and tact. It is essential that the digestion should be in perfect working order—food being taken at regular hours, and the action of the bowels solicited at a time fixed every morning, before or after breakfast. On rising, the feet should be placed in warm water, and the body thoroughly sponged with cold water. If the reaction is healthy, a shower-bath should be taken. Exercise is of paramount importance: in the case of a male, it should average ten miles a day, in a female, at least six miles. On going to bed, the feet should be bathed in cold water and dried thoroughly with a rough towel, until they are warm and red. If the feet be cold, sleep is impossible. The head should rest on raised pillows, and immediately before or after entering the bed some beef-tea, gruel, or a little whisky in hot water may be taken. A walk of one or two miles, preferably against a wind or up a hill, before retiring, is, in the case of males, often attended with excellent results. When in bed, by the light of a candle, some not too interesting book may be read until the letters and sentences become confusing, when the candle should be blown out, and sleep wooed. A non-professional friend informs me that for forty years he has systematised the best conditions for sleeping, and these are, in his own words:—

He closes his eyes and breathes very slowly, leaving as long an interval as he can before each inspiration. To keep out every idea that might lead to a train of thought, he mentally counts these acts of breathing up to twenty, and then begins again at one, two, etc., till asleep. Sleep comes on in from one minute to five minutes. At the last moment, he sometimes makes a *very* slight change of position, and this is almost always his last conscious act.

The attention to the breathing and the necessity for a slight monotonous effort in counting, produce physiological conditions which favour sleep.

When such measures fail to produce the desired effect, the question of hypnotics must be considered. Of these the bromide of potassium in a dose of 30 grains in half an ounce of water can be recommended, and its influence is heightened by the addition of 10 grains of hydrate of chloral. Alone the hydrate of chloral is a dangerous remedy and an insidious friend to the sleepless. If taken the dose should at no time exceed 30 grains, and the patient should be warned that its continued use saps the physical and mental tone. Of newer hypnotics, we may say that paraldehyde is safe and valuable, but its persistently nauseous taste restricts its use to hospitals or asylums. Sulphonal requires some hours to elapse after it has been taken before any effect is produced; and on awakening the patient's speech is thick and stammering and the gait uncertain. One of the best of the new hypnotics is chloralamide. During the last few years it has steadily grown in professional favour, and it is recognised as possessing all the advantages with none of the drawbacks of hydrate of chloral. Its action is increased by combination with the bromide of potassium, and a solution containing equal quantities of these drugs can now be obtained under the name of *chlorobrom*. This preparation is palatable, potent, and safe.

ALCOHOLISM

This term is applied to the diverse pathological processes and attendant symptoms caused by the excessive ingestion of alcoholic beverages. These are very different according as a large quantity is consumed at once, or at short intervals, or smaller quantities are taken at short intervals; hence they are subdivided into (*a*) acute and (*b*) chronic alcoholism.

Acute Alcoholism.—When a large quantity of alcohol is taken, its influence on the nervous system is manifested in muscular incoördination, mental disturbances, and finally narcosis. The pupils are dilated, the temperature is low, and the breath has a heavy alcoholic odour. The unconsciousness is rarely so deep that the patient cannot be roused to some extent, and in reply to questions he mutters in an incoherent manner.

Chronic Alcoholism.—The earliest symptoms of this form are muscular tremors, especially on waking, disturbed sleep, irritability of temper, dull headache, disorders of vision. Irritative dyspeptic symptoms are evinced by morning vomit, and by a sensation of sinking at the stomach, until a stimulant is taken. Chronic alcoholism may lead to peripheral neuritis or insanity.

DELIRIUM TREMENS

This form of alcoholism occasionally supervenes on a single debauch, but it much more frequently attacks the chronic male drinker, rarely if ever a female tippler.

Etiology.—The disease is caused by the abuse of alcohol: distilled spirits more surely than wine, wine than beer. The man, it may be added, who, with a highly-wrought nervous organism, drinks to excess to drown the consciousness that he is drinking, is more likely to be affected with delirium than the habitual drunkard, who may drink to excess, but is able to sleep it off.

Symptoms.—Sleeplessness is a most characteristic symptom, and this sleeplessness is associated with busy restlessness, a chattering tongue, fidgety hands, and imaginary spectra. The tongue is protruded in a tremulous way, as in fever, but it is not brown and parched, but moist and creamy. The pulse is soft and compressible; the skin often bathed in perspiration.

The patient may reply coherently to a question or two, but soon after relapses into the fancies characteristic of the disease. These fancies are not pleasant, but associated with the lowest and most repulsive forms. Thus rats, mice, serpents, and imaginary demons are crawling about him, and in endeavouring to escape or to destroy these his mind is sorely tried. Often he peeps suspiciously behind the curtain, draws the bedclothes over him, or attempts to leave his bed. Cowardice rather than violence is exhibited both with regard to himself and his actions towards others.

The disease tends to recovery, on the third or fourth day, by a sleep from which the patient awakes refreshed. In fatal cases the symptoms are aggravated, and attended with intense wakefulness, low muttering delirium, subsultus tendinum, and great exhaustion.

Pathology.—The subarachnoid tissue has been found so infiltrated with fluid as to raise the arachnoid above the level of the convolutions. The cerebral arachnoid may exhibit considerable opacity all over the hemisphere, and the ventricles may contain a small amount of fluid, while the cerebral arteries and other parts of the brain are perfectly healthy.

Treatment.—The objects in treatment are, to prevent the further introduction of the poison into the system, to quiet the nervous excitement, and to sustain the strength while the accumulation of alcohol is being thus eliminated from the system.

To fulfil these indications, all stimulants should be forbidden if the patient is young and strong, If there is a history of previous attacks, and the patient is weak, it is necessary to withdraw them gradually. The patient must be kept in bed and never left alone.

If the patient can be persuaded to take some beef-tea or chicken soup, there is not much danger in the disease nor necessity for medical treatment. If, as often happens, there is loathing of food, it seems advisable to place six grains of calomel on the back of the tongue. The liver is thus stimulated to action. In young subjects opium may not be necessary, but in old subjects opium with some stimulant is the best remedy. Thus 40 or 60 minims may be given of tincture of opium, and it should be repeated at intervals of six, four, three, or even two hours, until its effects have been produced, and then every twelve hours. Some prefer to give it with antimonial wine (F. 70); or, should the stomach be irritable, to substitute hypodermic injections of morphine. In whatever form the remedy is administered, it must be remembered that the object is to produce sleep; yet if the pupils are contracted under its use without sleep, it has been pushed far enough and its use should be discontinued. In young subjects, provided there is no obstructive heart disease, chloral acts well. Thirty grains may be administered in a draught, and may be followed in two hours by the same dose. Should no sleeping effect be produced, and should excitement be more marked, it is inadvisable to continue it. Many prefer to continue it in smaller doses with the bromide of potassium (F. 69). Chlorobrom, unlike chloral, can be given with perfect safety in an ounce dose even when there is heart disease, and after two or three doses sleep is secured. An impending attack may thus be averted. Nourishment as indicated should be given often and cautiously.

All force, as in the form of strait-jackets, should be discountenanced. The services of well-skilled attendants, combined with kindness and humouring of the fancies, seem to be sufficient, even in the most violent cases. It is well not to restrict the patient from reasonable muscular exercise, and this conduces to sleep and appetite. In ACUTE ALCOHOLISM the patient generally sleeps off the effects of his debauch. In CHRONIC ALCOHOLISM the great object is the withdrawal of alcohol, and a temporary residence in an institution where he can be carefully watched during the trying period of the first ten days is of great importance. The chief desideratum afterwards is to substitute an easily-digested and nourishing diet for the alcoholic stimulants, which can then be dispensed with altogether. Strong meat soups are of much value. The best medicinal remedies are bitter tonics, as nux vomica, quinine in small doses, calumba or gentian, with spirit of chloroform and capsicum (F. 86*a*).

LEAD POISONING

This occurs among those who are engaged in lead works, and those who handle the metal or lead salts in their occupations, as painters, typefounders, compositors, and white enamellers; or it may be the result of the impregnation of drinking-water with lead from the cisterns in which it is stored.

Symptoms.—The symptoms are in typical cases anæmia, blue line on the gums, constipation, and colic. The nervous system may be variously affected. There may be paralysis, optic neuritis, or delirium and hallucinations. Granular contraction of the kidney is common, and with it a tendency to gout.

Increasing weakness and marked constipation precede the colic, the pain of which is of no ordinary kind, but sharp, twisting, spasmodic, felt most at or around the umbilicus, and relieved by pressure.

A characteristic blue line is observed on the gums, which is due to the deposit of particles of sulphide of lead in the papillæ of the gums. This line is interrupted if a tooth be lost. In some cases lead paralysis follows, and is due to involvement of the musculo-spiral nerve, causing "Wrist Drop" from paralysis of the extensor muscles of the forearm. The supinator longus usually escapes. The affected muscles are wasted and paralysed, and the hand hangs powerless from the wrist; the fingers are more or less forcibly flexed: if placed with the palm downwards on the table the patient is unable to turn it round so as to bring the palm uppermost. The muscles which form the ball of the thumb are sometimes wasted and sunken, and if the muscles about the shoulders are attacked the joints lose their roundness, and the outlines of the bones can be felt much more plainly than is natural.

Most frequently both upper limbs are attacked, but the right usually suffers most.

As a rule the loss of power precedes the wasting, and the muscles present the reaction of degeneration, hence called "degenerative," but occasionally the weakness and wasting proceed together ("primary atrophic") and faradic and voltaic irritability are both lessened in proportion to the wasting.

Pathology and Morbid Anatomy.—The "degenerative form" depends upon the condition of the peripheral nerves, and on microscopical examination the nerves present the appearances generally met with in peripheral neuritis (see p. 420). The "primary atrophic form" is possibly dependent upon changes in the spinal cord.

Treatment.—If the hands of workers employed in lead works, etc., be properly washed and the nails cleansed before taking food; if the food be taken outside of the work, and if the bowels be acted upon weekly by a dose of sulphate of magnesium, there does not appear to be much likelihood of lead entering the system and creating the disturbances mentioned. But if these precautions be neglected there is a manifest probability of "lead poisoning" occurring, and if it should occur, the line of treatment is obvious: (1) to relieve the colic and constipation, and (2) to eliminate the lead from the system. Therefore give sulphate of magnesium in a dose of half an ounce every half-hour until a motion takes place. If after three or four doses no action be manifested, then administer a minim of croton oil. This rarely fails to secure a motion. The colic is best treated by hot fomentations to the abdomen frequently renewed. After the acute symptoms have subsided, sulphate of magnesium should be given with *small* doses of the iodide of potassium, the soluble iodide of the metal which results being eliminated by the action of the purgative. The diet should be nutritious, and when paralysis exists the application of a continuous current just sufficiently powerful to excite contraction of the affected muscles is recommended. If there be reaction of degeneration, faradic excitability will be lost and faradisation would be useless.

CHRONIC MERCURIAL POISONING

This is chiefly occasioned by the inhalation of the vapour of mercury in those who work in quicksilver mines, and in making mirrors, barometers, and thermometers. It rarely arises from the medicinal use of mercury, but is sometimes seen among bronzers, furriers, and hat-makers.

The *characteristic* of this form of poisoning is a peculiar tremor, known among the workmen as "trembles" and medically as "mercurial tremor." It usually begins in the face and tongue, and then invades the arms, and afterwards the legs. The tongue is tremulous; the speech hurried and jerky; the patient may be unable to walk without support. Various cerebral symptoms, such as hallucinations, outbreaks of maniacal excitement, occur in extreme cases. The *prognosis* is in most cases favourable as to the ultimate issue, unless the disease is too far advanced. For *recovery* it is essential for the patient to cease to work in mercury. For elimination iodide of potassium may be given in small doses,—two or three grains gradually increased.

SUNSTROKE—*Synonyms*, INSOLATION, HEAT-STROKE

Two forms are recognised, heat-exhaustion and heat-stroke. According to Sambron, sunstroke is an infectious disease. Prolonged exposure to a high temperature, particularly if combined with physical exertion, may produce extreme prostration, collapse, restlessness, and in some cases delirium. This is known as "heat-exhaustion." The skin is pale, cold, and moist, the pulse is quick and feeble, the temperature subnormal, and death may occur from failure of the heart. Complete recovery is frequent. The other form known as "heat-stroke" or sunstroke occurs from direct exposure to the sun's rays. In some cases the patient may be struck down suddenly, and may die within an hour with symptoms of heart failure, dyspnœa, and coma. In other cases, which are more common, the symptoms are pain in the head, giddiness, a feeling of oppression, and sometimes nausea and vomiting. Insensibility follows, which may be temporary, or which passes on to profound coma. The face is flushed, the skin is hot and dry, the temperature rises to 108°-110° F. or higher, the breathing is laboured and deep, sometimes stertorous, and in fatal cases delirium with convulsions supervenes. The fatal termination occurs within twenty-four to thirty-six hours. Recovery not infrequently takes place, favourable indications being a fall of temperature and the return of consciousness, but the recovery entails often after-consequences, as a shattered intellect, or permanent inability to bear high temperatures.

Treatment.—In HEAT-EXHAUSTION stimulants should be given freely, and a hot bath may be used. In HEAT-STROKE the indications are to reduce the temperature as quickly as possible. This may be done by a bath at 70° F., or by rubbing the body with ice, or by employing ice-water enemata. Antipyretics are less efficacious. In cases marked by intense asphyxia free bleeding should be practised to relieve the over-distended right heart. If recovery takes place, the patient should be removed to a cooler climate, and he should be warned against all undue exposure to heat, work, or mental anxiety of any kind.

NERVOUS DISEASES AND FEIGNED DISEASES

Much of the success of a medical practitioner depends on his being able to detect the early symptoms of any disease, and to base his treatment accordingly. Occasionally, diagnosis is very difficult; and, in the case of the exanthemata, it is well not to make a strong assertion until the characteristic eruption appears. In other instances, under the influence of a weak nervous organisation, certain diseases may be feigned, through as it were paralysis of the will and with no deliberate intention to deceive. Hypochondriasis and hysteria furnish notable examples of such cases; and paraplegia, incontinence of urine, joint affections, and anæsthesia or hyperæsthesia of the skin may be assumed. Marked sympathy being shown him or her, usually the latter, such a patient may become bed-ridden. The treatment, if the diagnosis is correct, is plain—strong measures and not drugs being the principal agents by which to effect a cure, and so restore an apparently afflicted person to sense and reason and action.

But in a third class, of what may be more properly termed "Feigned Diseases," there is deliberate imposture. Thus blindness, deafness, paralysis, or epilepsy may be assumed; and jaundice and insanity counterfeited. It is important to remember that in the majority of cases the impostor overacts his *rôle.* Blindness, deafness, or paralysis assumed are not proof against some sudden shock or mental impression. In jaundice, though vomiting may be induced, yet the conjunctivæ of the eyes cannot be made yellow. In epilepsy, if a fit occur, it is too much prolonged, the tongue is not bitten, and there is a vast amount of struggling without any actual injury, conditions not seen in a true epileptic fit. In feigned insanity no definite rules can be laid down. Common-sense and experience must guide the practitioner, and no doubt the benefit of a specialist in mental diseases should be sought. When incontinence of urine is simulated, it is often found that the urine does not dribble away, but is attended with an expulsive effort; and in feigned hæmoptysis there is no proper streaky admixture of blood with mucus.

DISEASES OF THE SKIN

The student of dermatology is, at the outset of his studies, embarrassed and bewildered at the unwieldy terminology usually attached to the subject. If the classifications and nomenclatures were constant, little or no difficulty would be experienced, but individual dermatologists commonly coin new names and classifications, so that at present there is no department in medicine in which diseases have so many synonyms. To avoid thus confusing the student we have described the various skin affections under their more common appellations.

Nor is any classification wholly satisfactory. The imperfect knowledge of cutaneous pathology renders a strictly pathological classification not free from objection, while that adopted by Willan and Bateman, although convenient and easy, is arbitrary and unscientific.

We have in this edition followed a pathological arrangement which for clinical purposes we believe will be more useful, although the classification which follows is not based on the elementary lesion; yet the student should have an idea of the nature and appearance of the more common lesions of the skin.

Thus *pomphi*, or wheals, are rounded elevations of the true skin, attended by active congestion and effusion of serum into the meshes of the skin; they are pale in the centre, appear and disappear with great rapidity, and are attended by an extreme degree of tingling and itching. Their occurrence seems intimately dependent on changes in the nervous system. They are seen principally in *urticaria*, or nettle-rash.

Excoriations are simply abrasions, and exhibit merely a ruffling or actual detachment of the epidermis. They often result from scratching.

Ulcers differ from excoriations in the fact that they involve the true skin, and when they heal they leave a cicatrix.

Rimæ, or fissures, are well seen in the cracks found on chapped hands.

Crusts consist to some extent of epidermic scales, but most largely of dust and desiccated blood, serum, or pus.

A *cicatrix* is the mark left by the healing of a wound or ulcer. In some forms of lupus cicatrisation goes on subcutaneously, the morbid tissue being replaced by cicatricial tissue without breach of surface.

Many skin affections are very intractable, and often at best only yield to treatment after a lengthened period; while others, again, are practically incurable, as elephantiasis and epithelioma. But if the true nature, the causes and conditions be rightly apprehended, and the requisite means adopted, a favourable issue in most instances will ensue.

The student should beware of making a DIAGNOSIS from an imperfect or partial examination of the patient, as the appearance of many skin affections rapidly changes. The whole cutaneous surface, whenever possible, should be examined.

Treatment.—The treatment of skin diseases is constitutional and local. Thus, constitutional treatment is sufficient in all the forms of syphilis except the ulcerative; local treatment is chiefly required in psoriasis (non-syphilitic). Usually, however, a combination of constitutional and local treatment is necessary, the former to combat the cause of the eruption, the latter to soothe the local irritation. Inflammatory affections must be treated by mild tonic aperients, followed, when the inflammation has subsided, by special tonics, as iron, arsenic, and quinine. For the non-inflammatory group arsenic is the special remedy.

Local Treatment.—Oxide of zinc ointment alone or with lanoline forms the basis of soothing ointments. Chronic eczema requires stimulating applications, as spirit of tar or oil of cade, while lupus is attacked by caustics. Newer remedies are *alumnol*, a fine white powder, which contains 5% of aluminium and 15% of sulphur; *resorcin*, a diatomic phenol, white crystalline plates, not unlike benzoic acid; *dermatol*, subgallate of bismuth, free from odour; *gallanol*, the anilide of gallic acid, a white impalpable powder. All these remedies are astringent, antiseptic, and non-irritating.

CLASSIFICATION OF SKIN DISEASES

I. Inflammatory Affections.

(*a*) *Superficial Inflammations*—

Eczema (acute and chronic)
Erythema
Urticaria
Impetigo
Roseola
Lupus erythematodes.

(*b*) *Deep-spreading Acute Inflammations*—

Erysipelas
Boils
Carbuncles
Ecthyma.

II. Anomalies of the Epidermis.

Psoriasis
Lichen (simplex, circinatus, and planus)
Pityriasis rubra
Pemphigus
Rupia
Cheiro-Pompholyx
Ichthyosis.

III. New Formations (Chronic Infectious Diseases of the Skin).

Lupus (L. vulgaris and L. erythematodes)
Leprosy
Syphilis
Glanders
Yaws
Elephantiasis.

IV. NEUROSES OF THE SKIN.

Pruritus Prurigo Herpes.

V. ANOMALIES OF GROWTH AND COLOUR OF HAIR.

Alopecia, etc.

VI. ANOMALIES OF PIGMENTATION (Chromatopathic Affections).

VII. ANOMALIES OF SECRETION.

(*a*) *Sebaceous Glands*—

1. Hypersecretion.
   Acne Acne rosacea Sycosis (Eczema pilare faciei).
2. Decreased Secretions.
   Xerosis.

(*b*) *Sweat Glands*—

1. Quantitative changes of sweat.
   Hyperidrosis Anidrosis.
2. Qualitative changes of sweat.
   Coloured Sweats (Cyanidrosis).

VIII. PARASITIC AFFECTIONS.

(*a*) *Animal Parasites*—

Scabies: Phtheiriasis (Pediculi capitis, corporis, pubis).

(*b*) *Vegetable Parasites*—

Favus (Tinea favosa); Ringworm (Tinea tricophytina) of head (T. tonsurans); body (T. circinata); and beard (T. sycosis).
Pityriasis versicolor.

IX. MEDICINAL RASHES.

I. INFLAMMATORY AFFECTIONS.

(*a*) *Superficial Inflammations*—

1. ECZEMA—CATARRH OF THE SKIN—is by far the most common and most important of diseases of the skin. It affects equally both sexes, and although no period of life is exempt from it, it is most frequently seen in childhood, when the skin is peculiarly soft and delicate. The symptoms presented in every case are characterised by hyperæmia, exudation, œdema, and in a later stage by the formation of crusts, scales, or infiltrations on a reddened, moist, or dry surface. Every form of the disease is accompanied by more or less severe itching. The succession of symptoms here mentioned may be more clearly traced in the form of eczema termed *acute.* Eczema may follow either an *acute* or a *chronic* course. Eczema may be regarded as chronic when it relapses, or occurs frequently in the same sites, or when certain secondary processes have set in, as conditions of swelling and hardening or atrophy of the glands and adipose tissue.

A great many varieties of eczema have been distinguished by different dermatologists, of which the following are the principal: — E. erythematosum, papulosum, vesiculosum, rubrum, squamosum, rimosum.

ACUTE ECZEMA (E. simplex) may occur on any part of the cutaneous surface, but it is chiefly seen on the face, genitals, hands, and feet. The eruption is ushered in by redness, swelling, and vesiculation, with sensation of tingling and tension. These local symptoms are accompanied by general uneasiness, gastric derangement, sleeplessness, and other febrile symptoms. The disease may be limited to the immediate neighbourhood of its primary situation, or it may extend extensively over the cutaneous envelope. Often the entire skin becomes very tender, and in such cases the slightest irritation will tend to develop the local symptoms on parts previously unattacked. In favourable cases the vesicles or pustules dry up and disappear with intense itching and the formation of crusts or scales, or the phenomena supervene of inflammatory eczema, which is characterised by a reddened and moist surface, a free discharge, at first of serum or pus, from the ruptured vesicles or pustules, which dries up into yellow, green, or brown crusts. The whole process occupies about a week or ten days, but the eruptions may return at the same or different places, and the disease may gradually become chronic.

Chronic Eczema presents the same local changes as the acute form, but from repeated attacks of inflammation, œdema and infiltration of the skin, with more or less profuse exudation and crusting, are added. The amount and consistence of the secretion from chronic eczema varies very greatly in the different varieties of the disease. In some cases (*dry eczema*) it may be entirely absent. At night or when warm in bed the itching is very distressing, and the irresistible inclination to scratch causes excoriation and increased exudation, which, although it relieves the itching, is replaced by a burning sensation. Chronic eczema, being often a sequence of the acute form, is found in the *same* situations as the acute variety, and also on *special* situations presenting special peculiarities. Thus, for example, it occurs in the form of *fissures* at various orifices as the mouth and anus, and also on the nipples of nursing mothers. On the palms of the hands, where the epidermis is naturally thick, the disease is characterised by the presence of deep fissures running between greatly thickened sections of epidermic tissue (*E. rimosum*).

Etiology.—An inherited delicacy of skin causes a predisposition to eczema, and in such cases slight external irritation may suffice to evoke an attack. But in addition to this there is evidently, in some individuals, a strong hereditary or constitutional predisposition to the disease. Certain diseases are important factors in the production of eczema, as dyspepsia, gout, albuminuria, nervous debility, uterine affections, pregnancy, lactation, and the tubercular diathesis.

Among the exciting causes the chief are the action of water alone, or when in the form of sulphur and saline baths, or from perspiration due to its alkaline character; or from the direct action of the sun in hot weather, or from the blisters which occur in those who perspire freely. In addition may be mentioned the action of numerous drugs, as irritating plasters, mercurial ointment, strong alkalies, rancid oils, and irritating powders; as well as the irritation set up by the presence of the *Acarus scabiei* or the *Pediculus capitis*.

Treatment.—To treat eczema successfully it must be determined whether the affection is acute or chronic, and the exact predisposing and exciting cause must be carefully estimated and if possible removed. There should be no empirical treatment of this or of any other skin affection. Each case should be treated on its own merits.

If acute, sometimes the best treatment is to let it alone, allowing the patient to be in bed lightly covered, and abstaining from the outward use of water. Still, local treatment is often necessary and useful to relieve burning and itching, and the most suitable applications then vary with the sites of the disease. If two cutaneous surfaces come in contact, as in *Eczema intertrigo*, cotton pads, which have been dipped in a powder containing 1 per cent each of finely pulverised boracic and salicylic acid, should be placed between these.

Pure starch flour is serviceable for moist surfaces and for the early stages of the papular and vesicular form. Hebra's diachylon ointment should first be used when the exudation is profuse, and when it is somewhat diminished the surface should be dusted, according to Unna, with a mull drawn through the melted lead ointment, and subsequently dried. When desquamation occurs, vaseline or zinc ointment proves useful.

If the diagnosis be chronic eczema, then the leading indications of local treatment are:—

I. The removal of the crusts.
II. The healing of the moist surface.
III. The removal of the hyperæmia and desquamation with coincident "itching."

1. The crusts should be removed by warm starch poultices, or by compresses of soft or distilled water frequently changed. When the disease occurs on hairy parts, oils and fats are preferable to water applications. They should be rubbed in with a painter's stiff brush, and the part should be afterwards covered with an oily application. As a rule, the crusts or scales

come off when the dressings are removed. The hard scales on the hands or feet yield best to salicylic acid applications, as Unna's salicylated gutta-percha mull, which may be applied for a day or two. When the mull is removed the hardened epidermis comes away, and then salicylic ointment may be rubbed in. Salicylic acid plaster is an elegant and effective application for removing horny epidermis. In certain cases it is necessary to apply soft soap when the epidermis is much thickened, and allow it to dry on the skin. Or a plaster of salicylic acid containing soap may be applied at once.

2. The second indication is to heal the moist surface, and for this purpose diachylon ointment is generally employed, and when this appears to be too irritating the milder zinc ointment, or ℞ ichthyol ʒii., lanolin ℥i. M., may be smeared over the parts two or three times daily. If fatty substances be not tolerated the affected surfaces may be bathed with liq. plumbi subacetatis. Linimentum calcis is soothing and astringent, and forms an excellent adjunct to one or other of the above ointments. By some of these methods the moist surface is dried by the slight astringent action of the applications. When a dry condition has been obtained Unna recommends the application of resorcin in the form of a paste, ℞ ungt. zinci, resorcini āā 10 parts, terræ siliceæ 2 parts.

3. To remove the hyperæmia and desquamation which now follow, tar in some form or other is invaluable. At first only very weak preparations should be used, and if they are well borne the strength may be gradually increased till almost pure tar is used. For eczema of hairy parts a solution of tar in spirit is useful as it can be applied with a brush. Tar should never be applied to a weeping eczema or where the skin is still greatly inflamed.

Constitutional treatment of eczema must not be neglected. Arsenic must be avoided when the disease is acute, but salines, with a careful regulation of the diet, are necessary. A seidlitz powder may be administered in the early morning occasionally in the case of an adult; and when a young child is the subject of the disease, a mild alterative of gray powder and rhubarb will be found valuable. The diet in all cases should be light and non-stimulating.

IMPETIGO.—The term Impetigo is still used to designate the cutaneous diseases Impetigo contagiosa and Impetigo herpetiforme.

IMPETIGO CONTAGIOSA, as it often attacks children in the same family, is said to be contagious. Vesicles, from the size of a pin to that of a lentil, appear most frequently on the face, forehead, and back of the hands. The bases are not usually inflamed, and they very soon dry up into a crust which *seems to be glued on.* These, on falling off, leave a smooth surface free from scales. There is no pain or itching, and the disease usually disappears spontaneously in from two to six weeks. The cure is hastened by zinc or white precipitate ointment.

IMPETIGO HERPETIFORME is rare; only a few cases have been recorded, and these occurred mostly in pregnant women, commencing in the final months. The outline of symptoms is an eruption of pustules arranged in groups, filled with a yellow purulent liquid, and drying into yellow flat scales under which a red contracted surface is perceptible, and which is surrounded by a succession of new clusters and rings of pustules. The pustules are always largest and most numerous on the anterior surface of the body and the inside of the thigh. Each crop of pustules is preceded by rigors, and the patients in fatal cases usually succumb to exhaustion.

The cause of the disease is still obscure.

Treatment.—This is antiphlogistic and alterative.

ERYTHEMA

The term "Erythema" is applied to inflammation of the skin, consisting of superficial and usually dusky red patches varying in size and depth of colour, disappearing under pressure and terminating in resolution and desquamation. One of the most important points in the clinical diagnosis of this affection is the *absence of itch.*

There are three chief varieties of Erythema:—1. *Erythema* *simplex* is generally acute in its course, and it may be accompanied by little or by very considerable constitutional disturbance. It has a sub-variety, "Erythema fugax," so called from its shifting character, and its appearing and disappearing at intervals on different parts of the body. Sometimes it is observed in fevers on the face, trunk, and upper extremities, and its appearance on such occasions forms an element in determining an unfavourable prognosis. 2. *Erythema papulatum* is often seen in young persons at the age of puberty, and is usually associated with some disorder of the menstrual or digestive functions. Small papules may appear on any part of the body, but, as a rule, the sites selected are the back of the hands, neck, or face. These papules spread and coalesce with one another until the parts affected are covered with a red blush, which lasts for a few days and then disappears, with some itching. 3. *Erythema nodosum* has a nodular appearance, the knots or patches being about one or two inches in diameter, attacking the surface of the legs between the knee and the ankle. It is always attended by much gastric and general disturbance, and often by articular pains and swellings, resembling exactly those of rheumatism. It is more common among females than among males, and occurs generally between the ages of 15 and 30. There are also sub-varieties, *Erythema leve* and *Erythema iris.*

Treatment.—Mild saline aperients are serviceable for simple erythema (F. 24). Rest in bed and tonics, more especially quinine or cinchona, are recommended for erythema nodosum; if the articular symptoms be prominent, the salicylates will prove useful. Greasy applications aggravate all the varieties of the disease, but soothing dusting powders (F. 55) give relief. Cloths soaked in whisky and water are also useful in the simple and papular forms; while the spread of the migratory variety may usually be checked by the application of a strong solution of nitrate of silver.

ROSEOLA.—After extreme heat or fatigue, slight fever sets in with tingling and soreness of the portions of the body affected. On these red circular spots appear as large as shillings, with a white spot in the centre. The original circular spots develop into rings varying in configuration and size, which are sometimes distinct and sometimes blended together. The fourth day may be represented as the height of the eruption, after which it gradually disappears.

Diagnosis.—The eruption of roseola may be difficult to distinguish from that of measles. The main points to consider are the history of the case and the character of the eruption. Roseola is not preceded by the running at the eyes or nose seen in measles, and it has no definite site where the eruption may first be observed, for it may appear on the neck, trunk, limbs, or face.

Treatment.—Alteratives, laxatives, and tonics, according to the state of the system at the time the roseolar eruption appears (F. 8).

Urticaria (Nettle-Rash) is a peculiar skin eruption characterised by efflorescences (wheals) varying in size from a bean to a thumb-nail, firm to the touch, pale-red or whitish in colour, and elevated above the level of the skin. It usually appears suddenly, has a brief duration or changes into a chronic character, causing violent itching, and progressing to recovery without desquamation. It appears, as a rule, without prodromata; but at times there are depression, malaise, nausea, fever, and headache, which last from a few hours to one or two days. The wheals may be scattered over the body without being confluent, or they may be close together or nodose resembling erythema.

Etiology.—The causes, direct or indirect, in every case are such as exert a special effect on the vaso-motor system, partly as a whole or partly on some portion of it. Every morbid factor followed by nettle-rash excites the termini of the sensory nerves, extending into the external skin or in the mucous membrane. They excite the vaso-motor nerves, reflexly cause the capillaries to contract, and by the surrounding paresis incite the transudation in a circumscribed region. So the wheal is produced, which accordingly represents nothing else but a localised œdema.

The direct causes affect the peripheral distribution of the cutaneous nerves and may take the form of direct pressure on delicate skins, or of cold, or of the action of the electric current, or of touching the skin with the common nettle, or of stings of insects, as mosquitoes, fleas, or bugs.

The indirect causes are a febrile condition, the taking of some kinds of food, as oysters, crabs, lobsters, salted sea-fish, mussels, pungent spices, strawberries or other fruits. Taking drugs, as copaiba, tolu, or turpentine, may, in certain individuals, always produce urticaria, and so also may fright, grief or anger, derangement of menstruation, or affections of the digestion and respiratory system.

Treatment.—In the acute form, if due to gastric causes, an emetic is not necessary, but a laxative, as pulv. rhei co. If it be due to a particular kind of food it is well to guard against relapses by forbidding this food being taken again. For the itching, either in the acute or chronic form, an excellent remedy is cold water, to which may be added vinegar or spirit of wine, or carbolic acid. Lotions may also be employed, as ℞ acid. carbol. gr. xxx., glycerini ℥ss., spt. rectificati ad ℥vj., or as oil of sweet almonds to which 5 to 10 per cent of menthol has been added. Ointments are, however, preferable to lotions because of their longer contact with the skin, as ℞ sulph. sublim. ʒi., ol. cadini ʒii., unguent. zinci ℥i. This should be rubbed in twice daily, and the patches afterwards dusted with starch. The methods mentioned generally succeed, but in cases which are especially chronic and troublesome, internal remedies should be given, as hydrobromate of quinine in 5-gr. doses every four hours, or strychnine with the galvanic current. A still more effective measure is atropine, as ℞ liq. sulph. atrop. ♏ii., ext. gentian. gr. xx., gum acacia q.s. Make xii. pills. One every four hours. It is stated that pilocarpine has succeeded where many other remedies had failed. In urticaria arising in young children during dentition an alterative of gray powder is very helpful. The coincident irritability of the skin may often be relieved by suitable doses of antipyrin. Wright gives calcium chloride.

Lupus erythematodes or Lupus erythematosus is a chronic hyperæmia of the skin ending in interstitial absorption and permanent scarring. It is doubtful if it is tuberculous in its nature. It affects chiefly women of from 20 to 40 years of age.

This disease commences as a slightly raised, shining, violet red patch, usually on the prominence of one or both cheeks. The gland orifices become dilated and filled with stagnated secretion, and the patch becomes covered with a thin greasy adherent scale. Starting as a small round patch, it spreads very slowly at the circumference, while the central portion heals, becoming white and hard, and leaving a permanent cicatricial appearance. There is no ulceration. Symmetrical portions of the face are often affected, forming the characteristic butterfly eruption. The back of the hand may also be affected. Treatment is unsatisfactory. Local applications of mild caustics are most useful, as mercurial ointments, lactic acid, or arsenious acid (1 in 400). Lineal scarification is advocated by some.

(*b*) *Deep-spreading Acute Inflammations*—

Erysipelas.—This disease has already been described; see p. 82.

Furunculi (Boils).—In most instances, although this cannot always be demonstrated, boils are associated with inflammation in a hair-sac. The feature of true furunculus is the inflammation leading to the death of a minute portion of the deep layer of the cutis. The plug of dead tissue is expelled by the process of suppuration, and a slow-healing abscess is so formed.

A boil starts as a small painful pimple, which by and by at its summit presents a yellow spot due to the formation of pus. It then becomes intensely red and œdematous, and the pain correspondingly increases and becomes throbbing in character. When the abscess has ripened the slough is discharged, and the signs of inflammation rapidly disappear.

Boils are seldom solitary, and are apt to occur in crops, and to occasion considerable constitutional disturbance. The nape of the neck, the buttocks and back are most frequently attacked. As in some cases the presence of boils seems to be associated with diabetes, the urine should always be examined.

Treatment.—Both local and constitutional treatment is necessary as a rule. Warm starch poultices, or water dressings of Goulard's solution, serve to relieve the pain and soften the epidermis. The application of a minute quantity of lin. iodi or carbolic acid 1 in 20 on a spicule of wood to the summit of the boil when in the papular stage, is often successful in arresting its development. Saline cathartics should only be given if there is coincident constipation; but iron, arsenic, and cod-liver oil are useful remedies when the disease occurs in debilitated subjects.

CARBUNCLE is pathologically identical with a boil, differing only in its extent, severity, and in the fact that there are several openings formed instead of one. The remarks made on boils are equally applicable to carbuncles, and the same line of treatment may be followed. Opium is recommended by some.

ECTHYMA.—This affection may be either *acute* or *chronic.* The *acute* variety consists of small rounded elevated patches distinct from one another. These patches soon become pustular and surrounded by a red areola. The pustules dry up and become replaced by hard thick adherent crusts. Usually several crops of pustules appear during the course of the eruption, which lasts from 10 to 14 days. This disease is commonly seen on the limbs and neck, rarely on the trunk or head.

CHRONIC ECTHYMA differs from the acute, as above described, in its duration and extent. In this form the eruption invades hitherto healthy skin and becomes extensive. It is accompanied by febrile disturbances, often of a hectic type. It occurs both in infancy and adult life. Children at the breast are sometimes attacked, the face and chest being the common sites of the eruption. It is a dangerous affection, and sometimes terminates fatally. Chronic ecthyma also occurs in adults whose health is undermined, but it may even be occasionally seen in the robust from the action of local irritants as tartar-emetic, sugar, and dirt.

Treatment.—Antipyretics and salines are useful for the acute variety. Locally, soothing lotions may be applied.

When the disease occurs in infants at the breast a change of nurse should be resorted to. Fresh air, scrupulous cleanliness, cod-liver oil, and tonics are also indicated.

II. Anomalies of the Epidermis.

Psoriasis.—The old name for psoriasis was "dry tetter." It commences with an eruption of papules, and on the papules scales form, large, perfectly dry and white, silvery in colour. On removing these the underlying surface of the skin is seen to be red and dry.

Symptoms.—The efflorescence may assume various forms. When the spots are minute the eruption is termed *Psoriasis guttata. Psoriasis nummularis, orbicularis* (healing in centre), *gyrata, diffusa, universalis,* and *inveterata* are names which are explained by the adjectives used.

Psoriasis makes its first appearance almost exclusively on the *extensor* surfaces especially of the elbow and knee joints. From these situations it may spread upwards and downwards involving the trunk and frequently the scalp and face. Although these localities are the most commonly involved, psoriasis may make its appearance on the palms of the hands and soles of the feet, and the nails may also be affected. Psoriasis of the palms and feet, if unaccompanied by the presence of the eruption elsewhere, should always excite suspicion of a syphilitic origin. This disease is attended by little itch, except during efflorescence, when the itching may be more or less severe, and it runs as a rule a chronic course.

Etiology.—The disease is often hereditary, and attacks both sexes at all ages, being, however, most common from the ages of six or seven to puberty. Its direct cause is unknown, though some attribute its occurrence to a gouty or rheumatic diathesis. In most instances no such influence can be established, and the disease is frequently seen in the robust and healthy. It is true, however, that debility, from whatever cause arising, seems, in those predisposed, to evoke the disease. Thus, prolonged lactation is a frequent cause. Season seems also to have a direct influence in determining the appearance of the eruption. Psoriasis more commonly appears in spring than in autumn, and at these two seasons it is more frequently seen than at any other time of the year.

Diagnosis.—The diagnosis of a typical case of psoriasis is usually easy. The eruption may be mistaken for syphilis, but it may be distinguished from a syphilitic scaly eruption by its locality, by its symmetry, by the silver colour of the scales, and by the absence of a history or other signs of syphilis.

Treatment.—Recovery may be secured by (1) internal or (2) external remedies separately or combined, but it is to be remembered that no method adopted is capable of preventing a relapse.

Liquor arsenicalis, freshly prepared, is often sufficient to effect recovery if given in the following way. Begin with six drops daily, in a teaspoonful of aqua menth. pip., during or after meals, increase one drop every two or three days up to twelve drops daily ; then if recovery be delayed increase more slowly, until twenty or even thirty drops are administered. If the patches begin to disappear, gradually diminish the dose. Arsenic is contra-indicated in acute cases. Another drug much used is potassium iodide in large doses. In some inveterate cases thyroid extract is very useful. Internal treatment may be satisfactory in slight cases, but as a rule it fails when the patches are large, so that it is advisable to combine it with external treatment, and this external treatment consists in the application of chrysarobin, tar, or pyrogallic acid. Chrysarobin ointment is slowly rubbed in once or twice a day over the affected parts, and under its use the scales shortly disappear and leave a red surface, which in due time assumes a natural appearance. In cases where the disease affects a large surface the patient should remain in bed until the application has effected its purpose. In slight cases chrysarobin paint, consisting of chrysarobin 1, pyrogallic acid 1, collodion 120, ether and alcohol equal parts sufficient to dissolve, is an effective remedy. It should be applied to the spots on alternate nights. It does not stain the linen. Alumnol spirit, $2\frac{1}{2}$ per cent, is also used, in a similar manner; after evaporation of the alcohol a white precipitate remains, giving the appearance of powdering.

Or an ointment of gallanol in vaseline in the proportion $\frac{1}{30}$, $\frac{1}{10}$, or $\frac{1}{4}$.

In the application of tar the scales must first be removed by natural thermal waters or warm sulphur baths, or by protracted baths in warm water, or by rubbing the scaly parts with ℞ sapon. virid. 50, sp. rect. 100; macerate for twenty-four hours, then filter and add 10 of spirit of lavender. The tar is afterwards applied, either pure or diluted, once or twice a day by rubbing it in with a soft brush. After the application the patient should remain in bed under woollen blankets for a number of hours. It is necessary to wear flannel next the skin, as the tar adheres very firmly to the clothing. If the scaling continues for some time the old layer of tar with the scales should be removed by a warm bath, soap, and spirit, before a fresh application is made. The formula given may then be employed advantageously. Pyrogallic acid in a 5-10 per cent solution, or in the form of an ointment, may be applied to the patches with a brush once or twice a day. Its action is slower than that of chrysarobin, but it has the advantage of not staining the linen as deeply as the latter drug. During the pyrogallic acid treatment tepid baths should be taken a number of times and then soap should be rubbed on the affected parts. The application of benzine removes the light brown discoloration left by this mode of treatment.

Pyrogallic acid treatment should only be adopted when the patches are small, for if it be applied to large patches grave symptoms from absorption may ensue.

Lichen.—Lichen is an inflammatory affection of the skin, usually chronic in its course, and characterised by an eruption of more or less accumulated papules clustered together or scattered thickly over the surface of the skin, attended with much itching and succeeded by a reddened and thickened condition of the skin. There are several varieties of this disease described, but only three demand attention:—

Lichen simplex.—Here the surface of the skin involved is of little extent and has no definite outline. The papules are about the size of a millet seed, and are chiefly found on the back and extensor surfaces of the limbs. This variety is comparatively mild, and is considered by some to be simply abortive papular eczema.

In Lichen circinatus the papules are arranged in round groups, or, more commonly, in perfect rings which spread circumferentially, leaving the skin in the centre either normal or stained of a yellowish-red colour. These patches occur generally on the chest and back.

Lichen planus (*Lichen ruber*) is a more important disease. The papules in this disease differ from those ordinarily found in being large and flat instead of small and acuminated. The surface of the papules is smooth, shining and polished, as if they had been rubbed down by long-continued friction. Their colour is characteristically of a lilac hue or of a deep purplish-red. The disposition of the eruption is peculiar. The patches, which are often symmetrical, occur at first on the limbs and subsequently on the body, and the individual papules of which they are composed are commonly arranged in long rows in single file, each papule being apart and discrete, so as to form dotted lines extending down the limb.

What is known as *Lichen agrius* is simply acute eczema; it constitutes the "grocers'," "bakers'," and "bricklayers'" itch. In it the papules are situated on red inflamed skin; there is much pain, tingling, and heat, with general feverishness, nausea, and vomiting; the tops of the papules are often broken off, and there is in consequence a thin serous discharge, the skin being left fissured with deep and painful cracks. In the lichen of scrofulous subjects, *L. scrofulosorum*, a very chronic variety, the papules are very small and pale, appear only on the trunk, cause almost no itching, and are arranged in patches or circles. *L. tropicus* is known as "prickly heat."

Treatment.—In lichen the local treatment consists in allaying the severe itching by baths, sedative ointments, or lotions (F. 55*a*, 57*a*), or by weak tarry applications (F. 60*a*, 64*b*), while the digestion is aided by mild laxatives and a simple diet. Cleanliness must be insisted on. In *L. circinatus* especially, and also in the other forms of lichen, arsenic is most valuable. In *L. scrofulosorum* cod-liver oil must be used, both internally and externally.

Pityriasis rubra is a formidable complaint, not infrequently fatal and often accompanied by renal disease and albuminuria. It is characterised mainly by intense redness of the entire surface of the body, excessive exfoliation of epidermis, and absence of infiltration of the skin and of moist exudation. The skin is tender, but not very itchy. The constitutional symptoms are severe, and are those chiefly of exhaustion and debility. It is by some regarded as a dry, universal form of eczema. The vivid redness of the skin, and the great size of the epidermic flakes which fall off, sufficiently distinguish it from other desquamative diseases.

Treatment is not satisfactory, though Fox states that by soothing applications externally and the administration of diuretics and then tonics internally, really remarkable results may be obtained. The tender surface is thus protected, while the hyperæmia is subdued and tone and strength are restored to the system.

Pemphigus (*Synonym*, Pompholyx).—The eruption in this affection consists of large watery blebs or bullæ, filled with transparent or turbid fluid. These blebs vary in size from that of a millet seed to that of an apple, and occur on different parts of the skin and mucous membrane. When the bleb is broken and healed it leaves a dark stain or a thin crust.

The disease, which follows an *acute* or a *chronic* course, is preceded by fever and constitutional disturbances, and locally by irritation and itching. Generally the prognosis is favourable, and the blebs dry up without leaving cicatrices. This skin affection is due to debility favoured by intemperance, bad diet, or cold, or it may be due to syphilis. Several varieties of the disease have been described :—*P. neonatorum*, peculiar to new-born children, is a grave disease, and usually terminates fatally. *P. foliaceus* is characterised by rapid formation and equally rapid rupture of the bullæ, leaving large readily-detachable flakes.

Rupia is generally syphilitic in its origin. Small flat bullæ arise, and their contents, which consist at first of serous fluid, soon degenerate into blood and pus. A thick black scab is formed, and beneath it unhealthy ulceration progresses, as indicated by a nasty-smelling discharge. The margins of the surrounding skin inflame, more serum is poured out, and the incrustation takes on a stratified appearance, resembling a limpet shell. The lower limbs and loins are the usual sites of rupia. Its duration may vary from two or three weeks to several months.

Treatment.—These diseases being attended with debility, it is essential to use means which will combat this, viz. tonics, a generous diet with wine, and fresh air. If the eruption be of syphilitic origin, iodide of potassium with pil. hydrarg. subchlor. co. (Plummer's pill) or the perchloride of mercury should be prescribed (F. 1). In non-syphilitic pemphigus, liquor arsenicalis in 3-minim doses, after food, is a most efficient remedy (F. 4). Locally, poultice and use antiseptic dressings; or better, dust the skin with iodoform.

Cheiro-Pompholyx.—This affection is marked by an eruption, invariably symmetrical, of small round vesicles or blebs, chiefly on the hands and feet, and attended by little or no redness of the skin, and by no eczema; it is very apt to recur. The vesicles are deep-seated and flat on the top, and soon dry up and scale off; they contain a clear alkaline serous fluid. The nails also are often attacked, being loosened and broken across at the root.

Treatment.—As the disease often appears in nervous and debilitated subjects, tonics, such as quinine and iron, will be useful. Locally, simple vaseline may be applied, or vaseline with a little tar ointment or liq. carbonis deterg.

Ichthyosis (or *fish skin*) is simply an exaggeration of the condition known as *xeroderma* or dry skin. It is usually hereditary, and is marked by suppression of the sensible perspiration and an increased development of epidermis. The skin is therefore dry, harsh, scaly, and cracked, the peculiar shape of the scales giving the disease its distinctive name. It appears first and is most severe on the extensor aspect of the joints.

Treatment.—The disease is incurable, but the patient may be made more comfortable by warm alkaline baths, followed by thorough inunction with almond oil or glycerin and water. Cod-liver oil should be given internally.

III. NEW FORMATIONS (Chronic Infectious Diseases of the Skin).

LUPUS is a chronic skin affection, usually occurring in young persons of tubercular or scrofulous temperament, characterised by a cell infiltration of the skin of a peculiar purplish-red colour. It terminates in cicatrisation with or without ulceration.

Lupus is the principal tubercular skin disease seen in this country. It occurs most frequently on the face, and attacks chiefly the nose and cheek. It may occur on any other part of the body, and by many dermatologists is then not designated Lupus but "Scrofuloderma." The disease is almost always insensitive.

LUPUS VULGARIS assumes two aspects or varieties. In the variety known as *Lupus exedens* the nodular deposits ulcerate; in *L. non-exedens* they do not. In the non-ulcerative form the nodules, which are small, softish, and red, and attended by no pain, become covered with little white scales. Then a sort of fatty degeneration occurs, the nodules shrink and die away, and leave a depression due to a loss of substance. In the other form ulceration instead of absorption sets in, the neighbouring tissues are invaded, and the edges are thick and red. It sometimes destroys the nose, including the mucous membrane and bones.

Treatment.—The scrofulous nature of lupus necessitates the use of tonics, especially cod-liver oil combined with syr. ferri iodidi or with acids and bitters. In the severe form, if there is any history of syphilis, use Donovan's solution or iodide of potassium with sarsaparilla. Locally, for the non-ulcerating form Sir Erasmus Wilson recommended the acetum cantharidis; while for the ulcerating type caustic applications are called for, such as chloride of zinc, nitric acid, or potassa fusa, or the lupous tissue may be scraped away with a curette. The thermo-cautery applied under chloroform is specially serviceable, and leaves little after-pain. In addition many other methods of treatment have been advised and carried out with a variable amount of success by different dermatologists. Dr. H. S. Brooke advises the use of a paste, consisting of the following ingredients, to be applied to the lupus patches at the outset of treatment:—℞ Hydrarg. oleatis ℥i., acidi salicylici grs. v.-xv., ichthyolis ♏xv., olei lavandulæ q.s. This application in many instances is effectual, and can be applied without pain. As the skin becomes accustomed to an irritant application its strength may be increased. If caustic applications after prolonged trial seem to give rise to irritation their use should be suspended, for in the case of adults long-continued irritation induced by such remedies has been known to evoke epithelioma. When a patient is instructed to apply an irritant remedy himself he should be warned that the skin should not be broken by the action of the application. If any signs of excoriation manifest themselves the remedy should be discontinued or used in a more dilute form. Favourable results have been obtained by Landerer, especially as a preliminary form of treatment, by the continuous use of balsam of Peru. As a caustic preparation Unna recommends the application of ℞ acid salicyl. liq. antimon. chlor. ext. can. ind. āā 1, creosoti 2, vaselini 5, lanolini 10, to the individual nodules, which are then covered with zinc plaster.

Although Koch's "tuberculin" does not appear to have been used in phthisis with much success, in lupus more benefit has been derived from its employment. Under its use rapid improvement takes place, but the improvement is not always permanent and relapses are common.

For the characters of Syphilis see p. 113; for Glanders, p. 106; for Framboesia (Yaws), p. 126; for Leprosy, p. 124. With reference to Leprosy we may add that there are two varieties—Elephantiasis tuberosa and Elephantiasis anæsthetica; a sub-group of the latter causes dislocation and amputation of the joints, and is hence termed Elephantiasis mutilans.

IV. NEUROSES OF THE SKIN.

PRURITUS (*prurire*, to itch) is, strictly speaking, the name rather of a symptom than of an independent disease, but there are affections so styled indicating mainly an involvement of the cutaneous or general nervous system, characterised first and chiefly by fierce itching, and often followed by secondary changes in the skin. Pruritus may be due to local irritation; to the presence of a poison in the blood, as bile, sugar, and the gouty and rheumatic poisons; to reflex changes, as from pregnancy or uterine disorders; or to senile changes in the skin.

As a separate disease three special forms of pruritus are noted:—

1. *Pruritus genitalium.*—This form is seen in diabetes, and in women at the change of life, or when suffering from disease of the os uteri, or when pregnant. In men it depends on eczema or uncleanliness; and in both sexes it may be due to the presence of Pediculi pubis.

2. *Pruritus ani.*—In adults this form is connected with piles, eczema, or constipation; in children, with thread-worms.

3. *Pruritus senilis.*—This form is met with in old age. The skin is atrophied, sometimes pigmented; it is studded with small papules, and shows indications of vigorous scratching. The itching, which is at times unbearable, and has led to actual suicide, is sometimes accompanied by a burning or gnawing pain, or by a feeling as if animals were boring their way through the skin.

Treatment.—Remove local irritants; attend to the action of the bowels; give generous diet, tonics, and cod-liver oil, with bromide of potassium at night to procure rest. The Turkish bath, followed by a shampooing and the inunction of vaseline, is sometimes of service. If the affection is due to Pediculi vestimentorum, tar and sulphur are often useful in the form of liquor carbonis detergens (Wright's), or in that of a bath of sulphide of potassium—4 ounces to 30 gallons of water. For *Pruritus genitalium* use the glycerin of borax, and for *Pruritus ani* an ounce of zinc ointment mixed with 60 grains of calomel, or lotions of tar with borax or dilute prussic acid, or ℞ boro-glyceride 50 per cent solution ℥ss., lanoline ℥ss.

PRURIGO has the same derivation as pruritus, and is sometimes dependent on the same causes. It is marked by intense itching and by the development of numerous isolated pale pinkish papules. In this country, as *Prurigo simplex* or *mitis*, it affects chiefly the under-fed and badly-kept children of the poor. The first step in the pathological process is the presence of some irritant, as dirt or parasites; this is followed by a papular eruption, chiefly on the back, the thighs, and extensor surface of the limbs. The itching is severe. The disease may last a few years, and gradually disappears as age advances.

The prurigo of Hebra is not uncommon on the continent, but it is rare in Britain. In it the papules are at first very small, pale, isolated, and scarcely visible, but the skin is rough to the touch. The itching is intense, and from scratching numerous blood crusts form. The skin becomes thickened and deeply pigmented. The eruption appears chiefly on the trunk and extensor surface of limbs, and when fairly established usually lasts through life. Hutchinson's relapsing prurigo usually first appears at the age of puberty. The papules here are decidedly red, often accompanied by erythema. As the name indicates, it is apt to recur, and its severity is greater in summer.

Treatment.—In Hebra's prurigo endeavour to improve the general health, see that the patient sleeps, and use soothing local remedies. For the prurigo of children, alkaline or sometimes tar baths, soothing ointments, the removal of the existing irritants, and the administration of small doses of quinine and rhubarb will generally effect much improvement.

HERPES is an acute non-contagious affection characterised by the development of groups of vesicles or blebs on circumscribed erythematous patches of skin. The eruption is accompanied in many instances by burning and intense pain, which may continue long after the disappearance of the vesicles. The skin affection lasts from six days in the simplest forms to twenty-one in the more complicated. The many varieties described are distinguished according to the locality, form, and grouping of the vesicles.

Herpes in its simplest form is sometimes seen on the lip and mucous membrane of the mouth in acute pneumonia, or during the progress of a common cold, or on the prepuce as the result of sexual connection, or of a constitutional rheumatic tendency. Hence the term Herpes labialis (H. facialis) and Herpes preputialis. A variety called Herpes circinatus consists of a ring ($\frac{1}{2}$ to $\frac{1}{3}$ of an inch broad) with smooth skin in the centre varying from $\frac{1}{4}$ of an inch to two inches in width. The vesicles are often very minute, and, when they dry up, seem covered with small scales.

Another variety to which considerable interest is attached, from its peculiar situation and its antiquity, for it was known to the ancients, is popularly designated "shingles," "zona," and "Herpes zoster."

The eruption of Herpes zoster is attended frequently by a chill and by intense local pain, either before or following on the decline of the eruption, so that it is looked upon as a neuro-dermal disorder, developed on the line of skin supplied by the affected nerves. This line, in nineteen cases out of twenty, follows the course of the intercostal nerves on the right side, in the position that would be occupied by a sword-belt. On this ground-work red patches appear of irregular oblong shapes, varying in size from two to three inches; next papules are seen scattered over the surface affected; then vesicles are observed at first minute, then larger, and frequently two or three, when they reach the size of small bladders, run into each other. The vesicles at first contain clear fluid, which becomes white and opaque, and afterwards purulent. Then the vesicles collapse and give rise to small black scabs, deeply embedded in the skin; after a time the scabs fall and leave depressions, which may be visible for several weeks. A similar eruption may follow the course of any of the cutaneous nerves. The *acute* course of the affection lasts from fourteen to twenty days.

Treatment.—Regulate the diet and attend to the bowels. Employ locally prussic acid lotion (F. 57*b*), or dust the part with a powder consisting of three parts of starch and one part of oxide of zinc. If the pain be severe, as it sometimes is in shingles, it may be necessary to use aconitina ointment, or to inject morphine in the course of the nerve. Protecting the part by means of cotton wool is frequently very beneficial; so also is the application of a coat of collodion, but this should be painted on before the vesicles break.

V. Anomalies of Growth and Colour of Hair.

Hirsuties, or undue growth of hair in abnormal situations, may sometimes be cured by the cautious use of depilatories (F. 65*e*). A more satisfactory method of treatment is to destroy the hair-papilla by means of a needle thrust to the bottom of each follicle, or by means of the electrolytic needle, the inflammation so excited obliterating the hair follicle completely.

Alopecia (or baldness) may be the result simply of hereditary peculiarity, or of ordinary senile atrophy, in which the hair-papilla takes part with the other tissues; or it may be due to syphilis, the eruptive fevers, parasitic disease, seborrhœa, or nervous affections.

Treatment.—While the cause of the baldness must be specially treated, the growth of the hair may be favoured by stimulating local applications (F. 62), and by general tonics. In syphilis, the hair will certainly grow again under suitable constitutional treatment.

Alopecia areata is a disease of the hairy scalp, characterised by the development of localised, usually circular, patches of baldness. The patches may unite, and thus the whole head become bald. The skin itself is not affected, though it is thinner from the loss of the hair-roots. There is no scarring. It is still matter of dispute whether the condition is a tropho-neurosis or, as Sabouraud and other French observers claim, due to the presence of a microbe. According to some the disease is contagious, and occurs in epidemics.

Treatment.—The bald patches should be stimulated by the application of stimulating antiseptic lotions, as tincture of iodine or oil of cade. If these fail, stronger preparations, as cantharides ointment or blistering fluid or traumaticin of chrysarobin (2%), may be tried. With the local treatment, nervine tonics, as a pill of phosphorus and strychnine, or Easton's syrup, should be given internally.

VI. Anomalies of Pigmentation.

Synonym, Chromatopathic Affections.

1. Excess of Pigment.—Excess of colour may be general or partial. In either case it is represented by increase of the normal pigment of the skin, giving rise to various shades of hue, ranging from olive to deep black. Examples of excess of pigment are seen in *Chloasma* and *Melasma*.

2. Deficiency of Pigment.—Defect of colour in the skin is due to absence or deficiency of pigment, and this may occur either in the rete mucosum or the hair. As a general affection it constitutes Albinism—the subject of it being known as an Albino; while as a disease it is termed *Leucopathia*, and its examples are *Achroma* and *Leucasmus*.

3. Aberration of Normal Colour.—Alteration of the colour of the skin is manifested by an excess of the elements which enter into the composition of the normal brown or black. Thus it may be yellow or olive (*Xanthochroia*), as in Ephelis and Lentigo. Excess of yellow-blue —a rare affection—is termed *Cyanochroia*.

4. Artificial Colouring of the Skin.—*Argyria* or *Melasma tinctum* occurs from the prolonged internal use of the nitrate of silver. The seat of the discoloration is the papillary layer of the corium.

A slight functional disorder may occasion arrest of the pigment-formation to a varied extent and become the cause of Achroma, as illustrated in the instance of the piebald negro. Lentigo is one of the commonest forms of Melasma, and is a natural concomitant of a delicate skin. Ephelis solaris and Ephelis ignealis result from the action of heat. "Copper colour" is a form of Melasma, and is seen in syphilitic affections. Morphœa and Scleriasis are accompanied by Achroma as well as Melasma, and so also to a greater degree is Elephantiasis. The prolonged use of arsenic gives rise to Melasma. Melasma with Achroma is sometimes associated with hysteria, nervous shock, and notably with Addison's disease—"bronzed skin." Melasma is generally seen in prurigo.

Prognosis.—The skin rarely returns to its normal state, and the prognosis is thus unfavourable.

Treatment.—Pigmentary affections are usually associated with constitutional derangement, and therefore require internal treatment, while the discoloration may be dealt with by local remedies. Of the latter the most effectual are alkaline lotions and ointments, lotions of acetic and hydrochloric acid, or of iodine or iodide of potassium. Hydrargyri perchloridum in mistura amygdalæ will remove freckles and the slighter forms of Chloasma; and the pigment is sometimes restored by the stimulation of cantharides. Friction is serviceable in every form of pigmentary discoloration.

VII. ANOMALIES OF SECRETION.

(*a*) *Sebaceous Glands.*

1. Hypersecretion.

ACNE (Acne vulgaris).—Common acne begins by the appearance of inflamed elevated red points. At the centre of each a pustule forms surrounded by a red base. The pustule bursts, and its contents are discharged.

The disease is chiefly situated on the back and face, and occurs principally in young adults of both sexes during the changes occurring at puberty. It is caused by obstruction in the duct of a sebaceous gland. The sebum either solidifies or the mouth of the duct may become blocked by external dirt. In either case a *comedo* (shillcorn) is formed, which is marked by the appearance of a black dot. The dark point is due to dirt entering the orifice of the gland. This condition forms *Acne punctata.* Nature's method of expelling a foreign body is brought into action. Suppuration takes place, which softens the hardened core of sebum, and by and by it is expelled by the rupture of the small abscess which forms. A small permanent circular cicatrix is formed if the disease is severe or occurs in strumous or debilitated subjects.

Another form of the disease, when there is much surrounding induration, is called *Acne indurata.*

ACNE ROSACEA is confined almost exclusively to the face, and is seen chiefly on the alæ nasi and about the mouth. It is associated with a hyperæmic condition of the skin forming bright red or purplish patches. In chronic cases the skin is apt to become red and coarse, and varicose and tortuous vessels are seen winding over the surface. If the disease is not checked, a hypertrophic condition is apt to follow, and the nose frequently assumes enormous dimensions (Acne hypertrophica).

Acne rosacea is commoner in females than males, and occurs in middle life. The disease is one of debility, from whatever cause arising, and it is often, though not always, associated with intemperance, good living, or diseases of the stomach and liver.

Sycosis is a pustular eruption confined to the hairy portions of the face. It is brought about by inflammation in the hair follicle, or oftener in the sebaceous gland in connection with the hair. Sometimes the disease is called *Eczema pilare faciei*, and it should be distinguished from ringworm of the face—Tinea sycosis.

Treatment.—In *Acne vulgaris* and *indurata* the treatment to be adopted is to remove the comedones as soon as they are detected. This is best done by means of the comedo tube or scoop. The face may with advantage be steamed at night, and this may be followed by vigorous friction. Strong stimulating applications, such as iodide of sulphur ointment (F. 65), suitable enough for mild and chronic non-inflammatory cases, must in the severer pustular forms be used with caution. A course of calcium sulphide in pill is often an effective means of arresting the tendency to pustulation, and large doses of cod-liver oil are beneficial.

Acne rosacea is best treated and controlled by carefully regulating the diet and forbidding alcoholic excesses. Sometimes when the disease is produced by debility, not induced by intemperance, a small quantity of wine is useful. Local stimulating applications are helpful, and the painting of the parts every night with a mixture of ℞ resorcin grs. 15, ichthyol grs. 40, naphthol 15 is followed by improvement, or ℞ naphthol 10, vaselin soft soap aq. 20, sulph. præcip. 50 parts, mist. ft. pasta. In *sycosis* the affected part should be closely shaved and salicylic acid or zinc plaster applied according to the amount of inflammation present. If there is much inflammation, the latter should be employed first.

Sometimes epilation, followed by the application of astringent and soothing ointments, effects a cure.

2. Decreased Secretion or Xerosis is associated with a dry and harsh condition of the skin. Emollients may be employed, and the use of too much soap should be avoided. Large doses of cod-liver oil should be taken.

(*b*) *Sweat Glands.*

1. Quantitative Changes of Sweat.

Hyperidrosis, Excess of Perspiration.—This is supposed to depend on the vaso-motor nerves, but in what manner is still obscure. It may be either general or local. General hyperidrosis arises from various causes, as acute rheumatism, gout, intermittent fever, phthisis, general debility, alcoholism, defervescence of febricula, emotional excitement, exercise, and hot weather. It is also produced by diaphoretics and the Turkish bath.

Local hyperidrosis usually occurs on one side of the body, the face, or the head. It may be seen in hemiplegia following central hæmorrhage. It is sometimes hereditary, and is occasionally limited to the palms of the hands and the soles of the feet.

Anidrosis, or deficiency of sweat, is a symptom in diabetes mellitus and chronic Bright's disease. It accompanies the early stages of fever, and is present when the skin is dry, as in psoriasis or myxœdema.

2. Qualitative Changes of Sweat.

Cyanidrosis or Chromidrosis.—In this rare condition the sweat assumes various colours.

Hæmatidrosis.—This is called "bloody sweat." Doubt exists if it ever occurred spontaneously. In a number of the cases reported the condition seems to have been due to self-inflicted punctures.

Treatment.—In excessive sweating—Hyperidrosis—dilute sulphuric acid and other astringent tonics are useful. Flannel instead of cotton should be worn next the skin, and sponging with vinegar and water is recommended; or use lotions ℞ acid. sulphurici diluti ʒii., aquæ Oi, or ℞ acid. tannici ʒi., spiritus rectificati ℥vi. Atropine injected subcutaneously checks the perspiration of phthisis, and belladonna liniment is useful in excessive perspiration of the hands.

For Osmidrosis—fœtid sweating—tar soap, frequent changing of linen, and thorough drying are recommended. Internally, give tincture of belladonna. Hebra's prescription for fœtid sweating of the feet is "℞ olei olivæ optimæ ℥xv., lithargyri ℥iii. et ʒvi. Boil. Make an ointment, and apply on strips of linen every twelve hours." Cork soles should also be worn.

Phillips uses ℞ potass. permang. gr. x., sp. rosmarini ʒii., alcohol ad ℥iv.—to be sponged over the parts three times daily; or ℞ acid salicyl. ʒii., bismuth subnit. ℥ss.

VIII. Parasitic Affections of the Skin.

(*a*) *Animal Parasites.*

Scabies depends on the presence of an animal parasite, the *Acarus scabiei* or *Sarcoptes hominis.* The acarus is rounded, somewhat like a tortoise in general shape, and is provided with eight legs. The male is smaller than the female, and wanders freely over the surface. The female pierces the cuticle, and forms under it a short S-shaped burrow (*cuniculus*), at the end of which is a small vesicle within which the insect lies; in the burrow will be found ten to fifteen black dots, the insect's eggs. It most frequently attacks the flexures of joints; notably it is first observed between the fingers, whence it may spread over the whole surface of the body with the exception of the face, upon which it is never seen save in a few cases in infants. The deposition of the acarus acts as an irritant; a vesicular eruption is formed, and with this is associated much itching, which is specially increased by warmth. The only certain evidence of the presence of the disease is the discovery of the insect and its burrows, but in the absence of this the following points are usually held to warrant such a diagnosis:—(1) A clear history of contagion, several members of the same family being generally affected; (2) the steady spread of the disease from one part to another; (3) intolerable itching, intensified by warmth, pain and the burning sensation characteristic of eczema being absent; (4) the detection of small pointed vesicles between the fingers and on the flexor and ulnar aspects of the wrists, with a pruriginous eruption on the front of the forearm, on the mammæ, genitals and inner side of thigh, the face and scalp being in adults invariably untouched. A valuable diagnostic sign in children is the presence of the eruption round the ankles, on the buttocks, and on the ulnar side of the wrists.

Treatment.—The acarus is most easily destroyed by the application of sulphur ointment (F. 60*b*). This should be rubbed in firmly for three nights in succession, and washed off by a warm bath on the fourth day, when the underclothing should be changed. The clothes worn should be fumigated by sulphurous acid gas, or destroyed. If the sulphur be continued too long, it gives rise to a very troublesome artificial eczema. In infants, and those whose skin is too irritable to bear the sulphur application, storax (F. 60*c*) may be used.

PEDICULOSIS (*Synonym*, Phtheiriasis) is the condition of skin induced by uncleanliness and the harbouring of lice about the person. There are three varieties of pediculi. The *Pediculus capitis* infests the head, especially of children, where its presence excites great itching and irritation, the scratching to which it gives rise occasionally causing eczema. The "nits" or ova of the lice, small white bodies, adhere to the shaft of the hair. The *Pediculus corporis* is larger than the head louse, and its ova are deposited on the clothing, not on the skin. The itching which it excites is intense. The great irritation brings out numerous small pale papules, especially on the breast and back; the tops of these are scratched off, and are usually seen covered by a small scale of coagulated blood. After some time the skin deepens in colour from increased pigmentation. The *Pediculus pubis* is found chiefly about the genital organs, occasionally in the armpits, or in the eyebrows and eyelashes. It is seldom seen in children.

Treatment.—For head lice or Pediculi pubis nothing is better than carbolic oil (1-8) or the 5 per cent solution of oleate of mercury. If the latter remedy be combined with a little acetic ether it will rapidly destroy the nits. Carbolic lotion (1-20) will kill body lice; but the clothing should also be exposed to the action of dry heat at a temperature of at least 250° F. The disease of the skin engendered by the presence of the pediculi is "easily cured by means of an ointment containing one part of the oil of delphinium staphisagria and seven parts of lard" (Liveing).

(*b*) *Vegetable Parasites.*

FAVUS or TINEA FAVOSA (Honeycomb Ringworm), a very obstinate and chronic affection, is due to the presence and growth of a fungus, the *Achorion Schönleinii.* It is most commonly met with on the scalp, though it may occur on other parts of the surface. In the early stages the patches are irritable and scaly, and the hair becomes harsh, dry, and quite lustreless; bright sulphur yellow crusts, small and distinctly cup-shaped, are soon formed, and through the centre of each of these pass a few hairs; eventually the crusts fall off, leaving dark stains and a scaly surface. The pressure of the fungus may destroy the hair-papilla, when permanent baldness results. The odour of the parts is said to be like that of cats or mice.

Along with the development of the favus cups the hair undergoes change. It loses its lustre, colour, and pliability. Consequently over the affected area it looks woolly and stubbly.

The disease is considered by many to be acquired from mice through the cat, children who play with a diseased cat becoming affected.

Upon examination under the microscope, a favus cup is seen to be almost wholly composed of the fungus, and the spores and mycelium can be readily detected. If a diseased hair, which is easily and usually painlessly extracted, be examined on a microscopic slide under a high power, after being treated with a drop of liquor potassæ, the same spores and mycelium can be seen throughout the structure of the hair. The spores of Tinea favosa may be distinguished from those of ringworm by their non-uniformity in size.

Ringworm (Tinea tricophytina) depends on a parasite which attacks the hair and grows into the bulb. Ringworm of the scalp is called *Tinea tonsurans;* of the beard, *Tinea sycosis;* of the body, *Tinea circinata;* while *Eczema marginatum* is applied to a form of ringworm which attacks the inside of the thighs and spreads over the gluteal region. At one time it was held that all forms of ringworm were due to a common parasite, but more recent investigations show that there are at least two varieties, a small-spored form, Microsporon Audouini, causing 90 per cent of the scalp ringworm of children, and a large-spored variety, the tricophyton, which is associated with ringworm of the beard, the skin, and the nails.

Tinea tonsurans is commonly seen in children, rarely in adults. At the outset the rings or patches are simply red, slightly raised, with a few small vesicles at the edges; subsequently there are observed round or oval, scaly or scurfy patches of comparative baldness, on which the hairs are dry and shrivelled, usually broken off short at the surface of the skin or a line or two above it, in such a way as to suggest the appearance of a stubble-field; the hairs are brittle and apt to break just within the follicle when epilation is attempted. At a still later stage the diseased part of the scalp may become inflamed, soft, and boggy, as if the seat of an abscess, and the follicles may suppurate or discharge a clear gummy fluid; this is the condition sometimes described as *Tinea kerion*, and is one of nature's methods of cure. In disseminated ringworm of the head the scalp is scaly, with here and there a few dry, shrivelled, and brittle hairs, and a few of the stumps above mentioned.

Tinea sycosis is characterised by pustular inflammation of the hair-follicles, the pustules being placed on little hard eminences, and terminating in yellowish-brown crusts.

Tinea circinata is marked by distinctly circular patches, which tend to spread steadily at all parts of their circumference; in extent they vary from the size of a shilling to that of a half-crown; their margins are red, raised, and slightly vesicular, while the centre has a yellowish-brown colour and has a tendency to scale.

TINEA VERSICOLOR (Pityriasis versicolor, Chloasma) is produced by the growth of the *Microsporon furfur*. It is characterised by the occurrence of yellow or fawn-coloured patches, often very symmetrical, on the chest and abdomen, occasionally on the upper arm or thigh; these are rough to the touch, and covered with fine branny scales. It is sometimes accompanied by considerable itching, and is a disease of adult life, and never attacks uncovered parts. Its development is favoured by want of cleanliness and by diseases associated with colliquative sweating, as phthisis pulmonalis.

Treatment.—In all forms of tinea this must be both local and general; local to destroy the parasites, general to strengthen the system and prevent the skin forming a suitable soil for their development. The general treatment consists in cleanliness, good hygienic conditions, nourishing food, cod-liver oil, syrups of the phosphate or iodide of iron (F. 81, 85).

Locally, poultice to remove scabs; clip the hair and epilate carefully in and around the diseased patches, this epilation being particularly necessary in favus and Tinea sycosis; afterwards, some parasiticide application must be employed, such as sulphurous acid, either pure or diluted, or oil of cade. In favus the part may be blistered, or a lotion of corrosive sublimate (F. 58, 58*a*), or the white precipitate ointment, should be used perseveringly; hyposulphite of sodium lotion, 60 grains to the ounce of water, is also effectual. In ringworm of the body a solution of nitrate of silver, or tincture of iodine, or acetic acid is sufficient. For sycosis employ, after epilation, F. 65 or any of the ordinary parasiticides. Ringworm of the head, if extensive, is obstinate; for it, after carefully extracting the diseased hairs, apply oleate of mercury, sulphurous acid, carbolic acid and glycerin, or Dr. Alder Smith's *compound citrine ointment* (F. 57*g*, 65*b*, 65*c*). Children suffering from ringworm should not be allowed to go to school. Morris cuts the hair for an inch round the patch, epilates all diseased hairs, and removes scales and dried sebaceous matter with a solution of soap in spirit or with spirit alone. Chrysarobin is then rubbed in for about ten minutes, and this is repeated daily till a reaction occurs in the shape of a red ring round the patch. Chrysarobin is then stopped, and zinc ointment applied till the signs of irritation disappear, when the chrysarobin is again applied until reaction is seen. After this process has been repeated two or three times marked improvement is apparent. Instead of chrysarobin oil of turpentine may be rubbed in, followed immediately before it is dry by tinct. iodi or liq. iodi fort. The resulting brown scale is removed by vaseline before the next iodine application. To prevent auto-infection carbolic oil should be used daily, and for some weeks after apparent cure ung. hydr.

ammon. (1 in 3) should be rubbed in twice a week. Tinea versicolor is readily removed by vigorous rubbing with soft soap and warm water applied with a piece of flannel; F. 58*a* is still more effectual. In Tinea decalvans (Alopecia areata) blister occasionally, or use F. 58.

IX. MEDICINAL RASHES.

Certain drugs, taken internally, are apt to give rise to skin eruptions. Belladonna or its alkaloid, stramonium, and hyoscyamus sometimes cause intense hyperæmia, closely resembling the eruption in scarlet fever. Quinine sometimes brings out patches of erythema; arsenic, a purplish staining of the skin or a herpetic eruption; iodide of potassium, purpuric spots on the legs, or pustules, like those of acne, on the face, back of neck, and shoulders; copaiba, a dark red, raised, hyperæmic or hæmorrhagic rash, not unlike that of measles, seen most commonly about the ankles and wrists; bromide of potassium, erythema and acne round the mouth and nose; chloral hydrate, a dusky erythematous eruption, sometimes combined with urticaria, found most often about the face and neck; mercury, an obstinate form of eczema; tar and allied substances, a very itchy variety of erythema; phenazonum (antipyrin), an erythematous, measly or urticarial rash, with or without considerable accompanying œdema.

The external use of certain drugs is apt to give rise to skin eruptions. Thus, tar sometimes produces a form of acne; arnica, an erysipelatous inflammation; while the erythema caused by mustard, turpentine, or other irritants is often followed by desquamation and brown staining, which may be permanent. Croton oil and remedies of a similar nature sometimes excite a very acute eczema, which leaves well-marked cicatrices. The croton-oil eruption may be mistaken for small-pox.

Treatment.—These eruptions, after the drug which has caused them has been withdrawn, should be treated simply on general principles.

APPENDIX

THERAPEUTICAL INDEX

Acne.

Sulph. Iod. (F. 65).
Sulphur Lotion (F. 57*f*).

Removal of Comedones, then use as a lotion ℞ Hydrarg. Perchlor. gr. ii., Glycerini ℥ii., Aquæ ad ℥vi. M.

Ague.

Quinine (20 to 30 grs. at the close of the paroxysm) ; or hypodermically (p. 97).

Mineral Spas.—Bath, Cheltenham, Carlsbad, Marienbad, Tarasp, Spa.

Alopecia.

Pilocarpine hypodermically, or F. 62.

Aneurysm.

Spare dry diet ; avoidance of excitement ; Iodide of Potassium (p. 253) ; Galvano-puncture, MacEwen's method.

Angina Pectoris.

Inhalation of Nitrite of Amyl when attack occurs ; to prevent recurrence, at first 1 m. of 1 per cent of solution of Nitro-Glycerin, increasing dose to m. 10. Erythrol tetranitrate, ½-2 gr.

Tranquil life ; abstinence from alcohol and tobacco.

Apoplexy (Cerebral Hæmorrhage).

Question of Venesection (p. 469). Croton oil or enemata. Rest in bed with head and shoulders elevated. Only after three or four weeks from seizure use constant current. Massage.

Asthma (F. 51).

Inhalations (Potass. Nitras, Stramonium cigarettes). Iodide of Potassium (F. 5). Lobelia Mixture (F. 46). Arsenic (F. 4). Nitrite of Amyl capsules. Strong coffee. Quebracho Tinct. ʒss.-ʒi. ; chloroform inhaled during paroxysms.

Climatic Treatment.—Amélie-les-Bains, Bournemouth, Montreux, Isle of Wight.

BED-SORES. (See under Typhus Fever.)

BILIOUSNESS. (See Lithæmia, p. 574.)

BRIGHT'S DISEASE.

Acute.—Warm bath, hot fomentations, dry cupping. Elaterium and Ext. Colocynth. Co. (F. 27). Potass. Acet., Scilla, Sp. Æth. Nit. (F. 37, 37*a*).

Chronic.—Wearing flannel, milk diet. Elaterium (F. 27). Pilocarpine (F. 34*a*). Iron (F. 76, 77, 78, 79). Potass. Iod. (F. 5). Extreme cases, Southey's drainage-tubes.

Pure Iron Springs.—Alexisbad, Brückenau, Schwalbach, Spa.

Compound Iron Springs.—Homburg (Luisen), Tunbridge Wells, Marienbad, Pyrmont, St. Moritz.

BRONCHITIS (Acute).

Early Stage, hot poultices of linseed meal. Vin. Ipecac., Tolu, Acacia (F. 45).

Vin. Antimon. ʒiiss., Sp. Chloroformi ʒiii., Aq. Camph. ℥v., a tablespoonful every two hours.

Vin. Ipecac., Liquor. Ammon. Cit., Tinct. Camph. Co. (F. 34).

After acute stage is past, Carbonate of Ammonium, Infusion of Senega.

BRONCHITIS (Chronic).

With little cough and free expectoration. Tinct. Camph. Co., Syr. Tolu, Mist. Ammoniaci (F. 43), or inhalations of alum or tannin.

With considerable cough, scanty expectoration. Ammon. Carb. (F. 44) ; Iod. Potass. ; Syrup Cocallini ʒi.-ʒii. every four hours.

Wyeth's Chloramine Lozenges. Inhalations of Pine (F. 54), or Acid. Hydrocyan. dil. Rarefied air (p. 171).

Climatic Treatment.—Bournemouth, Cannes, Mentone, Hyères, Meran, Torquay, Isle of Wight.

Mineral Spa Inhalations.—Ems, Lippspringe.

BRONCHITIS (FIBRINOUS).

Emetics (F. 41, 42). Potass. Iod., Calumba (F. 5).

BRONCHIECTASIS.

Ol. Terebinth. m. xx. ; Intra-tracheal injection of ʒi. of solution of menthol 10, guaiacol 2, olive oil 88.

CATARRH.

20 m. of Tinct. Opii or m. x. of Liq. Morph. Hydroch., and m. viii. of Vin. Antimon.

Forbid use of liquid for twenty-four hours.

If running at eyes and nose has commenced, the inhalation of spirit of camphor or menthol, and Sulph. Quin. gr. x. given internally ; or Turkish bath ; or better, brushing inside of nostril Cocaine 1, Menthol 2, Vaseline 10.

In chronic sneezing, inhalation of alum gr. 10, water ℥i., or iodised steam (p. 155).

Whey Cure.—Gais.

Mineral Spas.—Aix-les-Bains, Ems, Landeck, Baden in Austria, Neu-Ragoczy.

CHLOROSIS.

Blaud's pills in increasing doses daily (F. 89). See p. 331. Good food; change of air.
Mineral Spas.—Schwalbach, Homburg (Luisen), Kissingen, Tunbridge Wells, Marienbad, Cannstadt.

CHOLERA.

Prophylactic, careful dietary, no fruit, sanitary precautions.
For prodromic diarrhœa, various astringent remedies. Basis of these should be Acid. Sulph. dil., Tinct. Opii (F. 16, 17, 18), or Castor Oil ℥i. et Tinct. Opii 10 drops.
If Cholera diarrhœa commenced, astringents useless.
Essential Oils, Ether, Liq. Halleri (F. 18*a*), and Acid. Carbol., 2 gr. added to each dose.
If reaction begun—
Ice, aerated waters, brandy.
Morphine subcutaneously to allay cramps.
Turpentine stupes to abdomen.
Sinapisms to feet.

CHOREA.

In extreme cases, with great restlessness, chloroform, or chlorobrom (see p. 485); artificial feeding.
Liq. Arsenicalis in increasing doses, with Tinct. Cinchon. (F. 4).
Liq. Arsenicalis with or without Iron.
Arsenic continued four to five weeks until constitutional symptoms of its action are seen.
Then Arsenic stopped, and replaced by liquid preparations of Iron (F. 81). Sulphate of Zinc—Antipyrin.
Or, Hypophosphite of Lime (F. 82).
Or other tonic preparations (F. 75, 76, 78).
Mineral Spas.—Bourboule-les-Bains, Mont-Dore (contain arsenic).

COLIC, Hepatic (with passage of gallstones).

Chloroform, or enema of chloral, or morphine injection. Ice or hot fomentations. Cholecystotomy, question of, p. 309.
After crisis over, to dissolve those already formed, Ether Sulph. m. 60, or Ol. Terebinth with yolk of egg.
To prevent further formation, Tinct. Podophyll. m. 15 every second night. Salicylate of Sodium gr. 20 in a large quantity of water. Olive oil.
Diet such as not to cause acidity.
Mineral Spas.—Carlsbad, Kissingen, Homburg, or Vichy.

Lead Colic.
In ordinary cases—Sulph. Magnes. Mixture (F. 24).
In extreme cases—Ol. Croton. 1 to 2 m. on butter, followed, when bowels have acted, by Potass. Iod., small doses (F. 5).
If paralysis is present, constant current daily.
Mineral Spas.—Carlsbad, Homburg, Kissingen, Tarasp, Vichy, Marienbad, Cheltenham, Leamington, Scarborough.

Renal Colic.

Hot fomentations, administration of chloroform, morphine subcutaneously.
Ol. Junip., Sp. Æth. Nit., Tinct. Digital. (F. 39).
Nitrate of Potassium, Barley Water (F. 40).
Mineral Spas.—Vichy, Tarasp, Carlsbad.

Congestion (Cerebral).

If acute—
Leeching behind ears; quick, strong purgatives—Ol. Crotonis 1 to 2 m. on butter; Calomel and Jalap (F. 23), followed by Potass. Bromid., Ext. Ergot. Liq. (F. 71*a*).
If following on mental strain—
Laxatives, light diet, white meat, chicken, etc. Liq. Arsenical. (F. 4).
Sea-voyage. Complete rest.
If chronic, Hypophosphites (F. 82).

Congestion of Liver.

Leeches to hepatic region, followed by hot poultices.
Pil. Hydrarg., Ext. Coloc. Co., Ext. Hyoscyam. (F. 27*a*).
Afterwards (1) an alkaline mixture; (2) Acid. Nit.-Mur. dil. 1 m., 10 to 30 m. thrice daily with Taraxacum or Gentian (F. 79*a*).
Diet—Simple; stimulants and animal food forbidden.
Mineral Spas.—Harrogate, Kissingen, Marienbad, Carlsbad.

Constipation.

Diet.—Brown bread, onions, stewed prunes or figs, baked apples, bananas, ripe fruits; warm water before breakfast.
Medicinal Remedies.—Cascara Sagrada, Liquid Extract (Parke, Davies, and Co.), 20 m., 15 m., 12 m., 10 m. Glycerine Suppository.
With sluggishness of liver a pill of Euonymin gr. $\frac{1}{2}$, Leptandrin gr. $\frac{1}{2}$, Podophyllum gr. $\frac{1}{2}$, Ext. Hyoscyam. gr. $\frac{1}{2}$, at *bedtime;* or after *dinner* pill, Ext. Nucis Vomicæ gr. $\frac{1}{10}$, Ex. Aloes Soc. gr. $\frac{3}{4}$, Ferri. Sulph. gr. ii.
Mineral Spas.—Kissingen, Tarasp, Homburg, Leamington.

Convulsions in Children.

1. Lancing gums. 2. Castor Oil or Soap Enema.
3. Followed by warm bath.
4. After action of bowels, Potass. Bromid. gr. 2; Syrup Chloral m. x. in aq. ℥ss. every four hours. Chloroform.
5. Chlorobrom.

Convulsions in Adults (Uræmic).

Inhalation of Chloroform.
Chloral injections, 45 grs. to an adult (15 to a child).
Injection of Pilocarpine (F. 34*a*), or of Digitalin gr. $\frac{1}{60}$.

CONVULSIONS (Puerperal).

Chloral by Enema. Begin with 60 grains, and, if required, continue by 15-grain doses till an aggregate of 120 grains is reached.
Inhalation of Chloroform.
Venesection, question of (see p. 384).
If possible, hasten delivery by forceps.

CROUP.

If child strong and well fed, Leeches to Manubrium Sterni.
Emetics. Sulph. Cupri, 10 grs. in 2 ounces of water, a large teaspoonful every five minutes until vomiting is produced. Or Vin. Ipecac., a teaspoonful at same intervals.
Warm bath ; hot pack ; hot sponging ; tracheotomy ; intubation.

CYSTITIS.

Belladonna, Buchu, Copaiba.
Wash out bladder with solution of Boracic Acid.

DELIRIUM TREMENS.

If first attack, patient young and strong, stop stimulants at once ; if patient weak, history of previous attack, withdraw them gradually, or substitute a diffusible stimulant, as Ammon. Carb.
Unless looseness of the bowels exists, stimulate the liver to action by Calomel, 5 grs., followed by Black Draught.
When bowels have acted, Tinct. Opii, 40 or 60 m., repeated every two or three hours until sleep is produced ; or with Vin. Antim. (F. 70), or in the Hypodermic Injection of Morphine.
Hydrate of Chloral, gr. 30 every two hours, alone or with Potass. Bromid. (F. 69). Feeding most important.

DIABETES MELLITUS.

Dietetic.—Flesh meat, fowls, fish, green vegetables, or green parts of vegetables. Diabetic biscuits, tea or coffee sweetened by Lævulose ; for thirst, Acid. Phosph. dil.
Medicinal.—Codeine, Pilocarpine.
Mineral Spas.—Carlsbad, Vichy, Neuenahr, or Vals.

DIARRHŒA (Infantile).

Warm bath, temp. 100° F., for half an hour, then Calomel and Pulv. Ipecac. Co. in a small dose, repeated if necessary ; after twenty-four hours Castor Oil with 2 m. of Tinct. Camph. Co. If child not weaned, breast milk ; if weaned, cow's milk with lime water ; raw meat grated down with sugar (Trousseau).
Choleraic Diarrhœa of Adults.—Catechu and Chalk Mixture (F. 17) ; Brandy, Hazeline, Chlorodyne. Keratin-coated Carbolic Acid pills.
Diarrhœa of adults with griping pains, Calomel and Rhubarb.
,, ,, restlessness, furred tongue, Pulv. Antimon. gr. iii., Pulv. Ipecac. Co. gr. vi. ; after six hours Tinct. Opii in Mist. Amygdalæ.

Diphtheria.

General.—Stimulants from the first—

Tinct. Ferri Perchlor. m. 7, Potass. Chlor. gr. $\frac{1}{2}$, Glycerin m. 20, every twenty minutes.

Or Hydrarg. Perchlor. gr. i., Sodii Chlor. ʒss., Glycerin ℥iss., Aq. Dest. ℥iiss. ; a teaspoonful every two hours, or Antitoxin treatment. See Hypodermic remedies for doses.

Local.—After clearing off mucus by gargle or spray of lactic acid dilute 1 in 8 water, swab throat with Trikresol m. 5 or Acid. Carbol. m. xv., Glycerin ℥i., Aq. ℥i.

In *nasal diphtheria* use spray of 1% Acid. Carb. or Sodii Chlor. and a saturated solution of Boric Acid, or Perchloride of Mercury, p. 80. When signs of obstruction, tracheotomy or intubation.

Diet—Liquid food ; soup ; pounded meat with light broth ; milk and cocoa.

Convalescence.—Nourishing food ; wine.

If *Paralysis.*—Tonics : Iron, Quinine, or Strychnine ; constant current.

Mineral Spas.—Wildbad, Baden-Baden, Bagnères-de-Bigorre, Gastein, Plombières, Bath, Woodhall.

Dropsy.

(*a*) Removal of fluid by Skin—
Guaiacum and Nitre (F. 33).
Pilocarpine injections (F. 34*a*).
Turkish baths.

(*b*) Removal of fluid by Kidneys—
Squill, Liq. Ammon. Acetat., Infusi. Scoparii (F. 35).
Mercury, Squill, Digitalis (F. 36).
Potass. Bitart., Buchu (F. 38).
Potass. Nitras, Decoct. Hordei (F. 40).
Trousseau's Wine (F. 40*a*).

(*c*) Removal of fluid by Intestines—
Elaterium, Colocynth, Hyoscyamus (F. 27).
Potass. Bitart.
Pil. Cambogiæ Co.

Mineral Spas, Cardiac Dropsy.—Brückenau, Pyrmont, Schwalbach, St. Moritz, Sternberg.
,, *Hepatic Dropsy.*—Griesbach, Kissingen, Carlsbad, Tarasp, Homburg, Cheltenham, Leamington.
,, *Renal Dropsy.*—Fachingen, Leuk, Vichy.

Dysentery (Acute).

Pulv. Ipecac. 25 grs., Sodii Bicarb. 10 grs., Syrup. Aurantii ʒss. Repeat in eight hours ; if disease not checked, in four hours.

For two nights afterwards give 10 grs. of Pulv. Ipecac. ; and then 8-gr. doses of the same powder for four days.

A little Castor Oil after this.

During first eight hours no liquid ; but ice only to suck if thirst is great ; saturated solution of Sulphate of Magnesium, p. 105.

Dietary—Milk, yolk of eggs, strong soup. If great exhaustion, stimulants. Astringent rectal irrigations.

DYSENTERY (Chronic).

Here ulceration of intestines, Pulv. Ipecac. may still be given, but not in such large doses.
Vegetable astringents—Tannin, Rhatany, Gallic Acid (F. 19).
Mist. Cretæ, Cinnamon, Opium, Pulv. Aromat. (F. 18).
Pil. Plumbi c. Opio, Oxide of Zinc.
Or, twice daily, Pulv. Ipecac. Co. gr. v.
Bland nutritious diet. Sea-voyage.
Mineral Spas.—Tarasp, Marienbad, Carlsbad, Spa, Franzensbad, Rehburg.

DYSPEPSIA (Various symptoms—various remedies).

1. Want of appetite, with acidity—
   Ammon. Carb., Potass. Bicarb., Inf. Chiratæ (F. 10).
   Without acidity—
   Acid. Nitro-Mur. dil., Tinct. Gent. Co., Ext. Tarax. Liq. (F. 79*a*).
   Or Quin. Sulph., Acid. Sulph. dil., Syrup. Aurant. (F. 75), or Pepsin Porci gr. iii., Ext. Al. Barb. gr. i. in pill before dinner.
   Or Orexin. Hydrochlor. 7 grs. in water with meals.
   Mineral Spas.—St. Moritz, Tarasp.
2. Nausea and vomiting—
   Careful regulation of diet. Creosote, Sp. Chlor., Tinct. Camph. Co., Glycerin (F. 11*a*).
   Acid. Hydrocyanic. dil., Liq. Bismuthi, Sp. Chlor., Tinct. Card. Co., Aq. Camph. (F. 9).
3. Flatulence and belching—
   Carminatives, Tinct. Card. Co., Tinct. Zingib., Sp. Ammon. Aromat. (F. 13).
   If immediately after meals, Pepsin and Rhubarb (F. 91).
   If with rotten-egg flavour, Charcoal Biscuits. Creosote (F. 11*a*).
   If with great acidity, Sp. Ammon. Aromat., Liq. Potass., Tinct. Rhei (F. 73).
   Mineral Spas.—Kissingen, Homburg, Leamington.
4. Pain, Heartburn—
   Liq. Bismuthi, Sp. Chloroformi (F. 9), Wyeth's Soda Mint Tablets, Magnesia, Soda (F. 11).
5. Cramp—
   Calomel and Jalap, followed by carminatives, as Cardamoms and Ammonia (F. 13).

WATER-BRASH (Pyrosis).

Simply as a symptom of ordinary Dyspepsia—
Pulv. Kino Co. xii. grs., followed by a watery purgative, as Hunyadi Janos or Friedrichshall.
As evidence of Sarcinæ—
20 to 60 grs. of Sulphite of Sodium.
Rules as to food and drink, see p. 266.

ECZEMA (See Skin Diseases).

EMPHYSEMA.

Warm Climate.
Stramonium Cigarettes or Nitrate of Potassium Papers (F. 51).
For Cough—
  Emetic of Ipecacuanha. Injection of Apomorphine, gr. $\frac{1}{12}$.
Antispasmodics—
  (*a*) Tinct. Lobel., Sp. Æther., Tinct. Conii, Mist. Ammoniaci (F. 12).
  (*b*) Tinct. Card. Co., Sp. Ammon. Aromat., Acid. Hydrocyan. dil., Aq. Carui (F. 13).
  $\frac{1}{12}$ gr. of Apomorphine injected.
Warm Climate.
Climate and Health Resorts.—Montreux, Bournemouth, Lippspringe, Isle of Wight.

EPILEPSY.

1. Head placed in such a position that the tongue cannot fall back upon larynx. Neck-tie loosened. India-rubber placed between teeth.
2. If of syphilitic origin, Potass. Iodid., Hydrarg. Perchlor. (F. 1).
3. Bromide of Potassium with other bromides. Brown-Séquard's mixture (F. 71*b*). Continued for two or three years. Maximum dose at night, see p. 619.
4. In nocturnal epilepsy Bromide grs. 30 with Tinct. Belladon. m. 10 an hour before bedtime.
5. Borax, dose grs. 10 increasing to 80; when bromides not well borne, precede each dose with Liq. Cocainæ Hydrochlor. m. 3.

Local applications to back of neck—Dry-cupping, setons.
Diet—Vegetable and milk diet; stimulants and animal food forbidden.

ERYSIPELAS.

1. Purgative—Calomel and Jalap (F. 23).
2. Followed by Tinct. Ferri Perchlor., 30 to 40 m. every three hours.
3. When temperature lowered, 20 m. of Tinct. Ferri Perchlor. thrice daily.
4. Iron, Calumba, and Glycerin (F. 79).
5. Quinine; Antipyrin; Antifebrin.

Local applications—Flour, powdered starch, oxide of zinc, Collodion and Castor Oil, Ichthyol and Lanoline ointment. Ext. Bellad. and Glycerin equal parts.
Painting whole surface 5% Acid. Carb. Sol. or Sol. Argent. Nit. If on leg, line of demarcation with solid Argent. Nit.

EXOPHTHALMIC GOÎTRE.

Quinine 5 grs. daily, Iron (Pil. Ferri) 5 to 6 daily. Bromides.
Painting between eyebrows and upper lid with Tinct. Iodi, and protecting eye from injury with wet compresses.
Constant current. Saccharated Solution of Lime. Operation.
Diet—Milk and vegetables.
Mineral Spas.—Franzensbad, Pyrmont, Schwalbach.

FEBRICULA.

Saline purgative—Sulph. Magnes., Acid. Sulph. dil., Aq. Menth. Pip. (F. 24), or Seidlitz Powder.

Followed by—

Diaphoretic Mixture—Liq. Ammon. Acet., Sp. Æth. Nit. (F. 31), or Potass. Nitras, Decoct. Hordei (F. 40).

Or, at an early stage—

Tinct. Aconiti 1 m. every five minutes until 30 m. taken.

Diet of slops—Milk, gruel, arrowroot. No animal food.

Convalescence aided by tonics, Quinine (F. 75), or Iron and Quinine (F. 78).

FEVER (Typhoid).

Temperature of room 64° F. In early stages 3 to 4 grs. of Calomel.

Intestinal Antisepsis.—Keratin-coated Carbolic Acid Pills, or Liquor Chlori, or Carbonate of Guaiacol, see p. 46.

1. Complications—Diarrhœa of adults. If stools exceed four per day, but not before, an enema of 4 ounces starch and water alone, or with Tinct. Opii m. 8; or after each stool, Pil. Plumbi c. Opio.

   Catechu, Opium, Mist. Cretæ (F. 17), Carbonate of Bismuth, gr. 20.

   Diarrhœa of children. An enema of Pulv. Ipecac. Co. gr. 2; Acid. Tann. gr. 5; Gum Acacia ℥ss., Aq. ℥i. after each motion.

   If bowels confined, a small enema of thin gruel.
2. Hæmorrhage. No milk, iced essences of meat, and iced water slowly sipped.

   Cold to abdomen by various india-rubber applications.

   Acid. Gallic. gr. 15, Tinct. Opii m. 5 by mouth, or an enema of an ounce of starch and water with Tinct. Opii m. 15.
3. Tympanites. Ol. Terebinth, m. 10 every two hours.
4. Peritonitis. Opium, well bruised, gr. i. every three hours. Operation.
5. Bronchitis. Small doses of expectorants, as Vin. Ipecac.
6. High temperature. If temperature is 106° or 107°, cold bath; if for forty-eight hours 105°, a tepid bath gradually cooled down; if 103½° to 104½°, cold to head by india-rubber tubing cap, with tepid sponging of body or tepid bath (p. 49). Antipyretics, as phenacetin and antipyrin, are not advisable.
7. Question of administering stimulants, p. 38 and p. 49.
8. Diet. Milk best at regular intervals, half a cupful every hour or two hours. Iced water between these times. Total quantity in twenty-four hours, 2 to 3 pints.

   Milk occasionally supplemented by mucilaginous drinks, barley water, soup from mutton, with yolk or albumen of eggs, tea if it causes no flatulence.
9. Convalescence. Great care in changing diet; *no alteration till morning and evening temperature have been normal for a week.*

   Then, arrowroot, beef-tea. Gradual return to solid food.

   Short drives before attempting walking exercise.

   Tonics, Quinine (F. 75, 76).

Fever (Typhus).

Isolation. Pulv. Rhei Co., grs. 30 to 60.
After constipation relieved by tepid water injections.
Head shaved. Cold lotions applied to head. Cool bath, p. 38.
To prevent *bed-sores*, pledgets of cotton wool. To suspected parts apply white of egg, brandy, alum, or Glycer. Aluminis.
If formed, Charcoal poultice, Iodoform, or Dermatol.
Stimulants, question of, p. 38.
Delirium. Potass. Bromid., Chloral (F. 69).

Fever (Relapsing).

Rest in bed, milk, strong soup, wine, cold lotions to head, water with CO_2 to allay thirst.
Acid. Sulph. dil., m. 10 every two hours.
If symptoms of collapse, Ammon. Carb. and alcohol.
If delirium, Syrupus Chloral, m. 30 every two hours until ʒii. or ʒiii. taken.
Convalescence—Good food, Wine, Quinine and Iron.

Gallstones (See Colic, Hepatic).

Gout (Prophylaxis).

Diet—Lean meat, fruit, no sweet wines, Salts of Lithium, Piperazine, exercise.
If an attack—1. Calomel Tablets, 3, or Sir Charles Scudamore's Mixture (F. 68*a*).
2. Tinct. or Vin. Colchici, m. 20, quantity never to exceed m. 120 in twenty-four hours, with Magnes. Carb.
3. Suspend medicine if more than four stools in twenty-four hours.
Local Treatment.—Part wrapped in flannel or cotton wool, or poultice sprinkled with Tinct. Opii or Belladonna.
Diet during acute stage—
Milk, arrowroot, tea.
After attack abates—
Beef-tea, chicken soup, Lithia water.

Chronic Gout.

Mineral Spas.—Leamington, Cheltenham, Bath, Vichy, Homburg, Carlsbad, Tarasp, Teplitz, Wildbad, Wildungen, Harrogate.
New Treatment.—Dr. Mortimer Granville's Iodine treatment, or 68*b*.

Gravel.

(*a*) When urates predominate, Vichy or Carlsbad water, and Alkalies.
(*b*) When Phosphates, Nitro-muriatic Acid and generous diet.
(*c*) When Oxalates, plenty of cold water and no sugar.
During passage of calculus—
Barley water, Sp. Æth. Nitrosi. Hypodermic injection of Morph. Acetas. Warm poultices sprinkled with opium to the back. Question of chloroform, p. 392.
Mineral Spas.—Rohitsch, Sauerbrun, Roisdorf, Contrexéville, Vichy.

Hæmorrhage (Cerebral).

See Apoplexy.

HÆMORRHAGE from Stomach (Hæmatemesis).
Gallic acid, 10 gr. every four hours (F. 19).
Ice to be sucked.
If hæmorrhage is very profuse, inject m. x. of Injectio Ergotæ Hypodermica.

HÆMORRHAGE from Lungs (Hæmoptysis).
Acid. Sulph. dil., Tinct. Opii (F. 16).
Gallic Acid (F. 19); or
Injectio Ergotæ Hypodermica, 10 m.
Ext. Hamamelidis, m. xxx. every two hours.

HÆMORRHAGE from Nose (Epistaxis), Nasal Douches.
(*a*) With solution of Alum, Tannic Acid, or Ext. Hamamelis.
(*b*) Internally, Digitalis, Ergot, Gallic Acid.

HÆMORRHAGE from Kidneys.
Ice to back.
Pil. Plumb. c. Opio, one every three hours.
Ol. Terebinth. m. ii. to m. iii., Mist. Amygdalæ ℥ss. every three hours with caution. Stopped if pain or retention of urine ensues.
Tinct. Cannab. Ind. m. 20, Mucil. Acaciæ ʒi., Aq. ad ℥i. every six hours.

HEADACHE (Migraine).
For attack—Tinct. Guaranæ m. 30; Gran. Eff. Cit. Caff. gr. 30; Salicylas Sodii gr. 30 in strong coffee; Phenazonum gr. 20; Potass. Bromid. gr. 30; Nitrite of Sodium, 2 parts in 120 of water —dose ʒi. Strong tea or coffee.
General Treatment.—Correct digestive derangements, sea-voyage, residence at a high altitude.
Other forms of Headache—Plethoric.
Calomel Tablets, 4; Mist. Sennæ Co.

HABITUAL BILIOUS HEADACHE.
Podophyllum or Euonymin, followed by Easton's Syrup.

RHEUMATIC HEADACHE.
Sodii Salicyl. during the day; Hypnotic at night.

SYPHILITIC HEADACHE.
Liq. Arsen. et Hydr. Iod. (F. 3).
Mineral Spas.—Aix-la-Chapelle, Neuenahr, Harrogate.

HEART DISEASE (Valvular).
Cardiac Tonics—Digitalis Group—
If mitral disease, Digitalis at once (F. 88).
If aortic with good compensation, attention to diet, avoidance of excitement, regulation of the bowels.
If aortic with failing compensation, Digitalis (F. 88) with occasional doses of Tincture of Rhubarb.
Tincture of Strophanthus m. 3 at first, increased to m. 10 thrice daily; Citrate of Caffeine gr. 5; Liq. Ext. Convallariæ m. 8-10; Casca bark (Tinctura Erythrophlœi m. 5-10).

If dropsy, Calomel gr. ½ thrice daily; Pilocarpine (F. 34*a*).

Diet—Nitrogenous and albuminous fluid, no alcohol, tea or coffee weak.

Mineral Spas.—Homburg, Kissingen, Soden, Nauheim, p. 234.

Climatic Resort.—Davos Platz for mountain exercise, recommended by Oertel. Widerstandsgymnastik.

HICCOUGH.

Sucking Ice; Champagne; Charcoal Biscuits.

Spirit. Æth. 20 m., Tinct. Card. Co. ʒss., Aq. ℥ss.; draught.

Inject. Morph. Hypoderm. 5 m. = ¼ gr. of Acet. Morph.

Inject. Nitrate Pilocarpine, ¼ gr. in x. m. of water.

Chloral. Hydratis, Potassii Bromidi, Potassii Bicarb. āā ʒi., Liq. Morph. Acetat. ʒi., Aq. ad ℥vi. Two tablespoonfuls every three hours.

If chronic—

Tinct. Physostigmatis (U.S.P.) m. x., Potass. Carb. gr. x., Mucilag. Acaciæ ʒi. M. One dose thrice daily.

One teaspoonful of mustard infused in half-pint of boiling water, the infusion filtered, and draught given to patient.

HOOPING-COUGH.

Direct inhalation of a spray containing Carbolic Acid gr. 4, Glycerin m. 6, Sodii Carb. gr. 10, Water ʒi.; isolation; proper regulation of temperature; Belladonna in increasing doses; Fuller's Cure (F. 15*a*); Nitric Acid, Dr. Gibb's Cure (F. 15); Antipyrin; Emetics at fixed hour daily; Vin. Ipecac. or Apomorphine; Bromoform (F. 69*a*); outdoor treatment (p. 69); locally, Roche's Embrocation.

HYSTERIA.

Charcot's Moral Treatment—

Removal from home surroundings and sympathy; massage. Weir Mitchell Treatment, p. 507.

During a paroxysm the inhalation of Chloroform, or cold water dashed over patient.

If hyperæsthesia—

Potass. Brom. or with Chloral Hydras (F. 69).

If loss of sensation—

Constant current daily over affected part.

If vomiting—

Liq. Bismuthi and Acid. Hydrocyan. dil. (F. 9).

If paralysis—

Constant current; Strychnine (F. 80). Hypophosphites (F. 82, 82*a*).

In many cases of hysteria—

Tinct. Valerian., Tinct. Asafœt., Tinct. Lavand. Co. useful (F. 14).

If Catamenial irregularities are the cause—

Potass. Bromid. gr. xx., Sp. Ammon. Aromat. m. x., Aq. ʒi. S. et M.

Taken twice daily.

Mineral Spas.—Franzensbad (mud baths), Lippik, Wildbad, Teplitz, Lucca, Bath.

Incontinence of Urine in Children from Irritability of Bladder.
Tincture of Belladonna ; Copaiba ; Potass. Bromid.

Influenza.
Rest in bed, until convalescence is assured.
In ordinary cases—
Quinine 2 or three grains twice daily in sherry.
Symptomatic treatment in other cases.—
If pains—
Salicylate of Sodium gr. 20 four times daily.
If depression—
A saline aperient, then Strychnine.
For cardiac attacks—
Citrate of Caffeine gr. 5 three or four times daily, or injected hypodermically, p. 72.
For pneumonia—
Turpentine stupes, and stimulants.
Nervous Sequelæ—
Pain at first relieved by Morphine injections, afterwards massage, etc.
Neurasthenia—
Easton's Syrup, m. 20 thrice daily. Change of climate. Sea-voyage.

Jaundice (Catarrhal).
Treatment symptomatic—If constipation, Calomel gr. 2 or Pil. Hydr. gr. 2, Ext. Col. Co. gr. 1½ at night, followed in morning by Pulv. Seidlitz.
After constipation treated by ʒi. Carlsbad salts in warm water before breakfast.
If diarrhœa—Bismuth Salicylas gr. 10.
If gastro-duodenal catarrh prominent symptom—Pil. Euonymin, Iridin (F. 25*a*). Warm baths ; Turkish bath to relieve itching.
Diet—Spare : soups, light puddings, Vichy water, *no* pastry or alcohol, or fatty food.
Mineral Spas.—Carlsbad, Marienbad, Homburg.

Laryngismus Stridulus—
Potass. Bromid. with Chloral Hydrate (F. 69) ; Chloroform Inhalations ; Hot bath during paroxysms (p. 164).

Laryngitis (Acute).
Leeches to larynx of adults—to manubrium sterni of infants.
Hot water compresses to throat.
Diaphoretics, Liq. Ammon. Acetat., Sp. Æth. Nitrosi (F. 31).
Inhalations of Ol. Pini Sylvest. or Creosot. (F. 53, 54).
Question of tracheotomy, p. 157.

Laryngitis (Chronic).
Rely upon inhalations of Acid. Carbolic., Ol. Pini Sylvest. (F. 53*a*, 54).
Chloride of Zinc 30 grs., Aq. ℥i., or Tannin and Glycerin may be applied locally.
Errors of diet and hygiene corrected.
Rest, dry climate, respirator.
Mineral Spas.—Carlsbad, Ems, Marienbad, St. Andreasberg.

Lithæmia.

Pil. Hydrarg. gr. iv., Ext Col. Co. gr. i., or Euonymin gr. iv. at night, followed in the morning by Mist. Sennæ Co. Carlsbad or Friedrichshall before breakfast; Acid. Nit. Hyd. dil.; Gentian, Taraxacum (F. 79*a*).

Diet.—No sweet wines. Horseback exercise, rowing, golfing.

Locomotor Ataxy (Tabes Dorsalis).

- In early stages—
  - Well-regulated hydropathy, cold baths.
  - Spine rubbed with hot cloths at 70° to 80° F., gradually lowered to 50° F.
  - Sea-voyage advisable.
- *Mineral Spas.*—Bath, Baden-Baden, Franzensbad, Gastein, Pfeffers, Teplitz, Wildungen, Wildbad.
- In advanced cases—
  - Argent. Nitras, ¼ gr. doses in the form of pill, with bread, until 120 grs. are taken.
  - Potass. Bromid. to relieve fidgety sensation (F. 70*a*).
  - Suspension method (see p. 445).
- In far-advanced cases—
  - Attention to symptoms.

Measles.

In ordinary cases—Attention to bowels, Ipecacuanha, Citrate of ammonium (F. 34).

Cough and hoarseness—Paint fauces with Glyc. Ac. Borici. Cold compresses to chest.

If coryza severe, insert into nostrils a little of ointment, Cocaine and Menthol.

If temperature high, Phenacetin ¼ to 1 gr. every hour or two hours.

If broncho-pneumonia—Poultices, stimulants, other remedies p. 188.

Room darkened to relieve photophobia.

Meningitis (Acute).

Head shaved, ice applied, light excluded from room.

Active purgatives—Calomel and Jalap (F. 23), or Croton Oil, 1 m. to 2 m. Mercury until salivation is imminent.

If mercury not given, then Potass. Bromid. in large doses.

Food should be solely liquid—Beef-tea, strong soup. If swallowing objected to, use beef-tea enemata.

Mercurial Salivation.

If coppery taste, spongy gums, bad breath—

Tinct. Myrrh., Alum., Inf. Rosæ Acid., as a gargle (F. 48).

Borax and Glycerin (F. 50).

Potass. Iodid. in small and repeated doses (F. 5), preceded by Potass. Chloras for two days (F. 7).

For *mercurial palsy*—removal from exposure to fumes, and Potass. Iodid. (F. 5).

MYXŒDEMA.

Fresh Thyroid extract of sheep finely minced with brandy and water. Thyroid Tablets, 2 to 4 thrice daily. Glycerine Extract m. 10 twice daily. Thyroid Powder each represents active principle of half of a gland. Dose one powder. Merck's desiccated Thyroidin, dose 1½ to 5 grains daily in pills or pastilles (F. 8*c*).

NEURALGIA (Facial).

General Treatment.—Alcohol in small quantity with good food ; fresh air ; rest.

If anæmia, Iron with Nux Vomica ; Cod-Liver Oil if readily assimilated.

For attack.—Antipyrin gr. 15, Phenacetin gr. 5, Exalgin gr. 5, Cit. Caffein Efferv. gr. 60, Quinine gr. 5, Butyl-chloral Hydras grs. 3-5.

Hypodermic Injections and Morphine gr. $\frac{1}{12}$ with Atropine gr. $\frac{1}{250}$, or Cocaine gr. $\frac{1}{12}$, or solution of Carbolic, or Osmic Acid. *Liniments*: Lin. Opii, Chloroform. et Belladon. (F. 57), or Chloral and Camphor equal parts.

Unguent. Aconit. Small blisters applied, see p. 501.

Mineral Spas.—Altwasser, etc.

OBESITY.

Meat diet ; no fatty or starchy food ; no sweet wines ; little liquid at meals. Ebstein's cure : Restrict starchy food and beer ; allow freely fat meat, and for drink tea, coffee, light wines, mineral waters. Cold baths, exercise.

Oertel's systematic exercise on gradually increasing gradients.

Other Methods.—Frequent draughts of hot water two hours after food.

Medicinal Treatment.—Iodides of Alkalies. Thyroid Extract.

Mineral Spas.—Marienbad, Carlsbad, Kissingen, Homburg.

PARALYSIS.

(*a*) General Paralysis of Insane—Treatment only palliative.

(*b*) Hemiplegia—At first, complete rest. Three weeks after attack —Phosphorus and Strychnine (F. 80, 85, 86). Constant current. Daily friction over paralysed muscles, with flexion and extension of the same.

(*c*) Paraplegia—If evidence of congestion, Ergot and Bellad. (F 71*a*, 15*a*). If of malnutrition, Strychnine and Phosphorus (F. 80, 85).

(*d*) Bell's Paralysis—Persistent use of constant current. Strychnine (F. 80). If syphilitic, Potass. Iodid. and Hydrarg. Perchlor. (F. 1).

(*e*) Writer's Cramp—Rest if possible. Write from shoulder and use pencil or soft quill pen, so that any violent grasp becomes impossible. Massage. Induced and weak galvanic current.

(*f*) Infantile Paralysis—Ergot, Fluid Extract, 10 drops thrice daily in early stages. Constant current and local friction. If the stage of atrophy is reached, *no* Ergot, but Strychnine may be tried F. 80).

In various forms of paralysis, not far advanced—

Mineral Spas.—Baden-Baden, Bath, Bagnères-de-Bigorre, Gastein, Johannisberg, Oeyenhausen, Plombières, Teplitz, Wildbad, Woodhall.

PERICARDITIS.

If with rheumatism Salicylate treatment. Locally to relieve pain ice-bag or Leiter's tube, or leeches followed by warm fomentations.

Hypodermic injections of Morphine. To promote absorption a full-sized blister, Pil. Hydrarg., Digitalis, Scillæ (F. 36).

Failure of heart's action—Tinct. Digit. m. 5 every two or three hours with brandy.

If excessive effusion with dyspnœa, or if effusion purulent, paracentesis (p. 219).

Diet—Milk, or bread and milk, light puddings, whipped eggs. After Paracentesis nourishing soups and stimulants.

PHTHISIS.

Cod-Liver Oil (Ol. Morrhuæ Emulsio, F. 65*d*).

Calcis Hypophosphis c. Glycerino (F. 82).

,, ,, et Syrupus (F. 82*a*).

Creosote or Guaiacol (F. 81*a*). Carbonate of Guaiacol.

Inhalations—Ol. Lupuli et Ol. Pini Sylvest. (F. 52, 54). Creosoti vapor (F. 53). Vapor Iodi.

Night sweats—Hypodermic injection, Atropine m. 1-4 ; Agaricin gr. $\frac{1}{13}$ in pills ; Camphoric Acid gr. 30.

Diarrhœa—Tinct. Chloroform. et Morphinæ m. 5 ; Mist. Cretæ (F. 17, 18).

Hæmoptysis—If slight, Liq. Ext. Hamamelidis m. 20 ; if severe, Inj. Ergotæ ; Gallic Acid gr. x. ; ice cloths over chest ; sucking of ice.

To allay cough in late stages—Morphine and Hydrocyanic Acid (F. 71).

Counter-Irritants—Lin. Croton., Liq. Iodi fort., over affected part of lung.

Diet—Cod-Liver Oil most useful cream comes next. Alcohol, as rum with milk in the morning.

Sydenham's exercise on horseback.

Change of Climate. *Warm Climates*—Meran, Pau, Hyères, Nice, Cannes, Pisa. Open air sanatorium treatment.

High Altitudes.—Davos-Platz, Denver, Colorado Springs, Maloja. Sea-voyages in the early stages.

Grape cure—Meran, Vevey.

PHTHISIS (Acute).

Iced cloths to abdomen.

Hypodermic injection of Atropine.

Niemeyer's Pill—Quin. Sulph. 1 gr., Pulv. Opii et Pulv. Digital. āā $\frac{1}{4}$ gr. Fiat Pil. One thrice daily.

Nourishing diet ; stimulants at stated intervals in small quantities.

PLEURISY (Acute).

In the very earliest stage—Emplast. Cantharidis.

Early friction stage—leeches, hot poultices or fomentations ; hypodermic injection of Morphine ; controlling movements of affected side with adhesive plaster.

Internally, Tinct. Opii m. 8, or Liquor. Ammonii Acetatis, Sp. Ætheris Nitrosi, of each m. 30, every hour or two hours.

To promote absorption—small blisters. If patient *robust*, Mercury, Squill, Digitalis (F. 36). If this not advisable, Sodii Salicylas gr. 60 to 90 at first; then decrease dose when diuresis is established.

Paracentesis if effusion purulent.

,, ,, serous, but resisting ordinary treatment (see p. 206).

PLEURISY (Chronic).

If absorbents fail, paracentesis.

Health Resorts.—Colorado Springs, Davos-Platz, Meran, Montreux, Wiesen.

PNEUMONIA (Lobar).

In the majority of cases symptomatic. In severe cases pain relieved by leeches, followed by poultices; less severe cases, poultices sprinkled with Tinct. Opii.

Cough and expectoration.—In early stage—Morphine, Acet. Ammon., Vin. Ipecac. or Vin. Antimoniale, afterwards Ammon. Carb. (F. 73*a*).

Temperature—Phenacetin safest antipyretic 5 grs. every three hours.

Sleeplessness—Chlorobrom ʒiv.

Cardiac Weakness—Stimulants. Whisky ʒi. every hour or half-hour.

If cardiac failure threatened—Strychnine hypodermically $\frac{1}{36}$ to $\frac{1}{20}$ gr.

Diet—At first spare: soups, milk, eggs; afterwards nourishing chicken jelly, well-made beef-tea.

BRONCHO-PNEUMONIA. Uniform moist atmosphere of 62° F. to 70° F. Diaphoretic mixture, Liq. Acet. Ammon. m. 40, Sp. Æth. Nit. m. 25, Aq. Camph. ℥ss. After diaphoresis established, Ammon. Carb. If exhaustion, brandy. ℥ss.-℥i. in divided doses to a child in twenty-four hours. Question of cold affusion, p. 188.

PURPURA (Simplex).

Acid. Sulph. dil. m. x. with ½ gr. Quin. Sulph. every two hours.

Good diet, with wine.

PURPURA (Hæmorrhagica).

Tinct. Ferri Perchlor. (F. 78).

If Internal Hæmorrhage, Ol. Terebinth. or Creosote (F. 11*a*).

Horizontal position.

RHEUMATISM (Acute).

1. Salicylate of sodium (physiologically pure), 20 grs. every two hours; or Salicin, 25 grs. every two hours.
2. After forty-eight hours the salt or salicin should be given in the same doses every four hours for two days, and then every six hours for three days.
3. Then 10 grs. thrice daily for a day or two. Afterwards Tonics (F. 87).

Diet—At first milk, at stated intervals, then chicken soup. Convalescence aided by fish and white meat, with three or four ounces of claret daily.

Rheumatism (Chronic).

Potass. Iod., Inf. Calumbæ (F. 5). Guaiacum Mixture (F. 6). Phenazonum Mixture (F. 5*a*). Turkish baths.

In Lumbago and Pleurodynia.—Lin. Chloroform., Belladonna (F. 57*h*), followed by warm fomentations. If urine scanty, full doses of Citrate of Potassium at short intervals.

Mineral Spas.—Droitwich, Woodhall, Aix-la-Chapelle, Aix-les-Bains, Teplitz, Wiesbaden. Residence during winter in a warm climate.

Rheumatism (Chronic, with exudation, etc.) round joints.

Thermal Spas.—Bath, Baden-Baden, Teplitz, Wiesbaden, Wildbad.

Cold Sulphur Spas.—Strathpeffer, Moffat, Harrogate, Woodhall, or Buxton; temp. 80° F.

Rickets.

Hygienic rules, fresh air. Child not suckled after 10 months. Phosphorus (F. 87*a*), Ol. Phosph., Ol. Morrh. (F. 91*a*).

Scarlet Fever (Simplex).

Febrifuge Mixture (F. 11). Milk diet; Chlorate of Potassium gr. 60, water 1 pint, as a drink.

S. Anginosa—At first same line of treatment.

In hyperpyretic conditions, tepid sponging, cold to head and neck, etc. (see p. 61). Phenacetin $\frac{1}{4}$ to 1 gr. every hour or two for children between two and ten years of age.

Throat-secretion removed by pledgets of moist lint; throat sprayed with a weak solution of carbolic acid; Mixture of Tinct. Ferri Perchlor., Potass. Chlor. and Glycerin (F. 91*b*).

Excessive prostration—Ammon. Carb. 1 to 2 grs. in milk every two hours.

S. Maligna—Stimulants dietetic and medicinal.

Diet—Milk, beef-tea, soup.

Convalescence—Scale preparation of iron.

Flannel worn during desquamation.

Sciatica.

Rest. In acute stages—hot poultices along course of nerve.

In later stages—counter-irritation; small mustard plasters, or blisters, over seats of pain; hypodermic injections, Cocaine first $\frac{1}{12}$ gr. to $\frac{1}{3}$ gr. If this fails, Morphine, Sedative liniment (F. 57*h*). Turkish baths; hot and cold douches; massage.

If rheumatic, Sodii Salicylas; if gouty, Colchicum; saline aperients.

In chronic cases—full doses Iod. Potass. grs. 20 to 120 for four days; if this fails, Mixture of Phenazonum (F. 5*a*) or Salacetol (F. 7*a*).

Mineral Spas.—Buxton, Bath, Droitwich, Harrogate, Aix-les-Bains, Ischl, Teplitz, Wiesbaden.

Skin, Diseases of.

Acute Eczema.—*Local Treatment.* In *early stage* of papular or vesicular form, pure starch flour.

If *exudation profuse*, Hebra's diachylon ointment.

When desquamation occurs, zinc ointment.

Chronic Eczema. *Local Treatment*—

1. *Crust removed* by warm poultices or compresses of distilled water.
2. *Moist surface* healed by diachylon or zinc ointment, Liq. Plumbi Diacetatis, or Unna's Paste, p. 616.
3. *To remove hyperæmia*, Pic. Liquid. i., Spirit. i., then Naphthol or Chrysarobin ointment.

Constitutional Treatment. — Salines, with careful regulation of diets. Arsenic only given when no inflammatory symptoms exist.

Mineral Spas. — Schlangenbad, Wildungen, Lippspringe, Bath, Harrogate.

Psoriasis.—*Local Treatment.*—Chrysarobin ointment, or tar, or pyrogallic acid, 5-10 per cent solution. Preference given in most cases to the Chrysarobin treatment and Liq. Arsenicalis in increasing doses. When recovery is progressing, gradually diminish the dose of the liquor.

Alcohol in any form forbidden.

Diet such as not to cause acidity. Contrexéville or Vichy water.

Mineral Spas. — Earthy — Royat, Wildungen. Arsenical — Bagnères-de-Bigorre, Mont Dore. Sulphur — Harrogate, Moffat, Strathpeffer.

Urticaria—To *relieve itching*, Water with Vinegar, Aromatic Spirit or Spirit of Wine, or ointments as Sulph. Sublim. ʒi., Ol. Cadini ʒii., Unguent. Zinc. ℥i.

Internally.—Quin. Hydrobrom. gr. v. every four hours, or pill containing Liq. Sulph. Atrop. and Gentian, see p. 535. Calc. Chlor.

Scabies.—*For adults*, Ung. Sulph. (F. 60*b*) for three nights. *For children*, Ung. Storax (F. 60*c*).

In other skin diseases, Arsenic, Alkalies, Potass. Iod., Iron, Quinine, Cod-Liver Oil, Hydrarg. Perchlor. ; various lotions (F. 55*a*, 57, 57*a*) ; ointments (F. 59, 59*a*, 61, 64*b*, 65*b*).

Mineral Spas.—Baden, Bourboule-les-Bains, Contrexéville, Kreuznach, La Bourboule, Mont Dore, Royat, Soden, Harrogate, Strathpeffer, Woodhall.

Sleeplessness.

Exercise ; attention to bowels ; cold bath.

Position in bed.—Head high, warmth to stomach, warmth to feet. Attention to these things lessens the cerebral circulation, and this anæmia of the brain is an essential condition in producing sleep.

Hypnotics.—Preference given to a solution of Chloralamide and Bromide of Potassium, 30 grs. of each (Chlorobrom).

Small-pox.

Early incubation stage (papular) — Saline aperient (F. 24), Diaphoretics (F. 31).

During pustular stages, Salicylic Acid (F. 6*b*), Sod. Bicarb. or Ammon. Carb. (F. 44).

At a later period in the pustular stage—Ferri et Ammon. Cit. (F. 90).

Local Applications, Prick Pustules on Face.

Apply Acid. Carbol. and Glycerin (F. 56*a*).
Or Acid. Carbolic., Glycerin, Gelatin, and water (F. 6*c*).
Warm alkaline baths.

In Secondary Stage.

Bromide of Potassium and Hydrate of Chloral (F. 69).
Beef-tea and nourishing diet.
Gloves worn to prevent scratching.

STOMACH (Ulcer of).

Bismuth. Subnit. gr. v., Sod. Bicarb. gr. iv., Pulv. Opii gr. ¼, twice daily, or large doses of Bismuth. Subnit. 20 to 30 grs.

Liq. Bismuthi, Acid. Hydrocyan. dil., in mixture (F. 9). Creosote m. 1 with Opium gr. ¼.

Carlsbad salts in early morning—to correct acidity, dislodge gases, and act as a gentle aperient. Dose ʒi.

Most reliance placed on complete rest to the stomach, the strength being sustained by nutrient enemata (see p. 263).

SYPHILIS.

1. Inunction of Unguent. Hydrarg. every night.
2. Hypodermic injection of Perchloride of Mercury (F. 2*a*). Other mode of preparation, see p. 116.
3. Gluten-Peptone Sublimate injection, see p. 117.
4. Fumigation, 8 to 10 grs. of Calomel sublimed by heat, deposited on skin of patient.
5. Internal administration of Hydrarg. c. Cretâ, ii. to iii. grs. twice daily.

   Pil. Hydrarg. Subchlor. Co. (Plummer's Pill), twice daily.
   Perchloride of Mercury combined with Potass. Iodid. (F. 1).
   ,, ,, in the form of Pill with Ext. Gentianæ (F. 2).
   Zittmann's Decoction (F. 8*b*).

Mineral Spas.—Aix-la-Chapelle, Aix-les-Bains, Neuenahr, Kreuznach, Vals, Cheltenham, Harrogate.

VOMITING.

Liq. Bismuthi, Acid. Hydrocyan. dil. (F. 9).
Creasote, Tinct. Camph. Co., Sp. Chloroform. (F. 11*a*).
Creasote 1 m., and Pulv. Opii gr. ¼ as a pill.
Occasional doses of Hydrarg. c. Cretâ; Morphine hypodermically.
Carbolic Acid in pill; Blister over epigastrium; Cocaine; Oxide of Zinc.

Sea-Sickness—

In long voyages, before going on board, Cholagogue Pill (F. 27*a*). Spare, dry diet on board for two days. Chlorobrom at night, dose ℥ss.

In short night voyages, no supper, Chlorobrom same dose.

In day-light passages, ʒi. previous to embarkation. Repeat dose when steamer leaves. Horizontal position.

Vomiting of Pregnancy—Vin. Ipecac. m. 2; Aq. ℨi. hourly; Cerii Oxalas gr. 2; Tinct. Pulsatillæ m. 5-30. Iced water occasionally.

WORMS.

Tapeworms.

At bedtime Ext. Filicis Liq. m. 60-90 (F. 29) on empty stomach, followed next morning by Castor Oil. Inf. Cusso, Ol. Terebinth.; Pelletier. Tannas gr. 6 or Kamala gr. 60.

Lumbrici (Round Worms).

Santonin, grs. ii. to iii. in Syr. Sennæ, or F. 30.

Thread Worms.

For children—

Enemata of cold water, Infus. Quassiæ, Liq. Calcis, or cold tea. Occasional doses of Hydrarg. c. Cret.

For adults—

Tinct. Ferri Perchlor. ℥ss. to 1 pint of water as an enema.

BATHS

COLD BATH, to reduce temperature—

1. Cold affusion. The patient is placed in a bath and four or five gallons of cold water thrown over him.

2. The patient is placed in a bath about 90° F., and the temperature is gradually reduced to 80°, 70°, or 60° F. The patient is kept in the bath for about twenty minutes. Alluded to in continued fever (p. 38).

3. Cold bath at once at a temperature of 60° to 90°. Ice may be put into this bath and the temperature reduced to 45° if the patient's temperature is very high, as in some cases of pneumonia, cerebral rheumatism, and pericarditis. Alluded to under rheumatism (p. 132).

COLD SPONGING.—This is employed in cases when the previously-named baths might be dangerous. The loss of heat is due partly to the application of the cold water, and partly to the evaporation which takes place from the surface of the body. It may be employed in diseases where the temperature is 104° to 105° F., as in typhoid fever.

MUD BATHS.—These baths are prescribed in cases of hyperæsthesia, sleeplessness, and female disorders. Various Continental spas have the mud for these baths conveyed from divers places, but undoubtedly the natural home for the best mud baths is at Franzensbad. This spa is situated on a "peat moss"; and portions of this moss are worked up into a soft poultice consistence and at a temperature of 98·5° F.; the patient undressed sits in this conglomerated mass for ten or fifteen minutes. The sensations imparted are those of great rest and physical repose, with a tendency to sleep after emerging from the bath and being sponged with lukewarm water. They are generally ordered to be taken on alternate days.

Turkish Baths.—These baths are employed in chronic rheumatism, sciatica, lumbago, and Bright's disease. The bath consists usually of three rooms, one for undressing and for resting in after the bath is finished; a second at a moderate temperature of 130° to 140° F.; and a third or hot room, where the temperature may reach 180° or even 200° F. The patient is recommended to sit or lie on a couch in the second room for half an hour until perspiration is freely established, sipping cold water if necessary to allay thirst. He may, after the expiry of the time mentioned, try the hot room for fifteen minutes; but this should never be done if there is any tendency to cerebral congestion, if perspiration is not thoroughly established, and if a sensation of giddiness is experienced. After leaving the hot room the patient should proceed at once—not delaying in the second room—to the shampooing room, where an experienced rubber should knead individual muscles, and stretch arms, legs, and small joints firmly, yet without causing any pain, which is never to be desired. Afterwards the shampooer should lather him with soap, and allow the hot-spray bath to play on him for a minute or two, gradually bringing on first tepid and then cold spray. A swim through a cold pond completes the bathing process in most well-regulated Turkish bath establishments; coming from the pond he should be enveloped in a warm sheet and rest in the dressing-room until he feels perfectly cool, and then he should leisurely dress. If the Turkish bath is taken in winter a cup of coffee or tea should be drunk before going into the open air, and it is better to walk home than to be driven.

Vapour Baths or Russian Baths are not recommended for invalids. Some persons in good health seem to enjoy them, but they are inferior both in utility and comfort to Turkish Baths. Calomel fumigation is referred to at p. 117.

Acid Bath.—An acid bath is prepared by mixing eight ounces of nitro-hydrochloric acid with a gallon of water at 98° F. Flannel is soaked in this, then wrung out thoroughly, and applied as a compress to the liver. It should then be covered with oil-silk, and may be allowed to remain on for some hours, or even a day. This acid compress is recommended in enlargement of the liver, especially in cases in which this is caused by residence in a tropical climate.

Alkaline Bath.—This is prepared by adding sixty grains of crystallised carbonate of sodium to each gallon of water. It is useful in chronic skin diseases.

Conium Bath.—This bath is prepared by adding to a full-length bath of tepid water at 98° F. three handfuls of conium leaves. In chronic skin affections, attended with great itching, as eczema or prurigo, it is singularly valuable. The patient should rest in it for about twenty minutes, the bath being covered with a sheet and waterproof, and the head free. In this way there is no danger of the narcotic vapour affecting the cerebral circulation, or the central nervous system.

Sulphurous Baths. — Artificial sulphurous baths are prepared by dissolving sulphurated potash in water—half a drachm to the gallon. Such baths have been recommended in psoriasis and chronic rheumatism. They are, however, much inferior to the natural sulphur baths obtained at Aix-la-Chapelle, Aix-les-Bains, and Neuenahr, the benefit from which in constitutional syphilis and chronic rheumatism is very great.

Pine Bath. — At various Continental spas of a muriated saline character, as Homburg, Kissingen, or Marienbad, pine baths are in common use. To the water of these spas heated in a bath about eight ounces of decoction of pine are added. This gives the bath a pleasant perfume, and the sensation to the skin of the bather is delightful. They are recommended in chronic gout, chronic rheumatism, and hyperæsthesia.

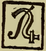
Mustard Bath.—The mustard bath requires about sixty grains of mustard to be added to a gallon of water. A foot-bath or a full bath of this is recommended in some cases to bring out the eruption in exanthemata. In neither case should the bath be continued longer than ten minutes.

PRESCRIPTIONS, TABLES, ETC.

Every qualified practitioner, on being called to a patient, may be required, in addition to dietetic rules, to embody his ideas of medicinal treatment in the form of a prescription. This prescription is written out in Latin, a language which should be familiar to every educated man. It is the masonic badge of our profession, and he who is ignorant of it, or uses it wrongly, is an interloper in the practice of medicine, although he may have received his degree from a university or licensing board.

In ancient times every prescription or formula had at its commencement certain characters, abbreviations, and sentences of a superstitious or pious character, such as

+—The sign of the cross.
α and *ω*—Alpha and Omega, the beginning and the end.
C.D.—Cum Deo.
J.D.—Juvante Deo.
L.D.—Laus Deo.
N.D.—Nomine Dei.
J.J.—Juvante Jesu.

These constituted the invocation. Ancient authors also used the sign  being the old heathen invocation to Jupiter, seeking his blessing upon the formula, equivalent to the usual invocation of the poets and Mahomedan authors, or the *Laus Deo* with which bookkeepers and merchants' clerks formerly began their books of accounts and invoices, a practice now almost extinct. "It is at present so disguised by the addition of the down stroke, which converts it into the letter R, that were it not for its cloven foot, we might be led to question the fact of its superstitious origin" (Paris, *Pharmacologia*). Without doubting this origin, we may say that at the present time, in beginning a prescription with ℞, we understand by it the abbreviated form of recipe, the second person singular, imperative mood, of the verb recipio, -epi, -eptum, -ĕre. Recipe, as a part of an active transitive verb, governs the accusative case; hence the quantity of the drug to be weighed or measured is placed in the accusative.

If in	grains	=granum,	gen.	-i, acc. pl.	grana.
,,	minims	=minimum,	gen.	-i, ,,	minima.
,,	drachms	=drachma,	gen.	-æ, ,,	drachmas.
,,	ounces	=uncia,	gen.	-æ, ,,	uncias.

The drugs prescribed, being governed by the word denoting the quantity of medicine ordered, are placed in the genitive case. Thus—

Extractum Colocynthidis Compositum = Extracti Colocynthidis Compositi.
Pilula Hydrargyri = Pilulæ Hydrargyri.
Magnesii Sulphas = Magnesii Sulphatis.
Vinum Ipecacuanhæ = Vini Ipecacuanhæ.
Tinctura Camphoræ Composita = Tincturæ Camphoræ Compositæ.

Each drug ordered should have a separate line, and to this recipe is understood, the quantity being in the accusative case, and the name of the drug in the genitive.

At the end of the prescription *misce* is placed, being the second person singular, imperative mood, of misceo, -ui, -stum or -xtum, -ēre; or, if a solution is wanted, *solve* may be employed, being the second person singular, imperative mood, of solvo, -vi, -utum, vĕre.

The directions to the patient should be preceded by *signa*, mark thou; or *signetur*, let it be marked.

The initials of the prescriber are appended to the prescription.

An unabbreviated prescription for an expectorant mixture will now be given with its basis, adjuvans, corrigens, and vehiculum.

Recipe—Ammonii Carbonatis drachmam (Basis).
Tincturæ Scillæ drachmas tres (Adjuvans).
Tincturæ Zingiberis drachmas tres (Corrigens).
Infusi Senegæ ad uncias sex (Vehiculum). Misce.
Signa—A tablespoonful every four hours.

With reference to directions, which should be written in English, there should be no dubiety, and all strong medicines used externally should be labelled POISON, or for EXTERNAL USE.

Wealthy patients, as a rule, have graduated measure glasses, with which they apportion their doses; middle-class or poor patients generally use familiar domestic articles. Thus—

A teaspoonful	is equal to	1	fluid drachm.	
A dessertspoonful	,,	2	,, drachms.	
A tablespoonful	,,	4	,, ,,	or ½ ounce.
Two tablespoonfuls	are equal to	8	,, ,,	or 1 ounce.
A wineglassful	is equal to	1½ or 2	fluid ounces.	
A teacupful	,,	5	,,	
A breakfastcupful	,,	8	,,	
A tumblerful	,,	10 or 12	,,	

These are only approximately equal, most spoons being larger, some much larger, than here indicated.

If a medicine is ordered three times a day, it is understood that the nurse will give it at certain hours—the usual time being, if it is ordered "three times a day," 11 A.M., 3 P.M., 7 P.M., unless special directions to the contrary be given in the prescription, or by verbal message from the physician in attendance. "Bedtime" means 10 or 11 P.M., if the patient is bedridden, the latter hour being understood if the patient is able to go about. If the directions are every three or four hours, it is not intended, except under special circumstances, that the patient, if asleep, should be roused to take the medicine. Medicines being ordered to be taken before meals, it is inferred by this that half an hour or twenty minutes should intervene; if after a meal, the same lapse of time is understood. Pills and powders are, probably to those unaccustomed to their use, most easily taken covered by jam or jelly. Pills are easily taken by placing them well back on the tongue, bending the head *forward*, and then swallowing saliva, or a little water. Sometimes a pill or powder may be placed in rice-paper moistened, and a bolus being thus made, the latter is swallowed somewhat like an uncooked oyster.

APOTHECARIES' TABLES

WEIGHT

20 grains (gr.) . . . . =1 scruple, ℈i.
3 scruples . . . . =1 drachm, ʒi.
8 drachms . . . . =1 ounce, ℥i.
12 ounces . . . . =1 pound, lb.

			1 sc. ℈i.	= 20 grs.
		1 dr. ʒi.	= 3 ,,	= 60 ,,
	1 oz. ℥i.	= 8 ,,	= 24 ,,	= 480 ,,
1 lb.	= 12 ,,	= 96 ,,	= 288 ,,	= 5760 ,,

MEASURE

60 minims (♏) . . . . . . =1 fluid drachm, f. ʒi.
8 fluid drachms . . . . . =1 fluid ounce, f. ℥i.
20 fluid ounces . . . . . =1 pint, Oi.
8 pints . . . . . . =1 gallon, C (congius).

				1 minim (♏i.)
			1 dr. ʒi.=	60 ,,
		1 oz. ℥i. =	8 ,, =	480 ,,
	1 pt. Oi. =	20 ,, =	160 ,, =	9600 ,,
1 gal. C=	8 ,, =	160 ,, =	1280 ,, =	76800 ,,

1 fluid ounce of water weighs 437·5 grains.
I minum ,, ,, ·91 ,,

We will now allude to abbreviations in prescriptions. Those sanctioned by usage are—

℞ = Recipe.
ʒ = Drachma.
S. = Solve.
S. et M. = Solve et Misce.
Gr. = Granum.
℥ = Uncia.
S. = Signa or Signetur.
Q.S. = quantum sufficiat (as much as may suffice).
m. = Minimum.
M. = Misce.

The numerals representing the exact quantities are the declinable adjectives—Unus, -a, -um; duo, duæ, duo; tres, tres, tria; or indeclinable, as decem, viginti, triginta, quadraginta, sexaginta.

Semis expresses the half, and the symbol is ss.; occurring alone after a symbol of quantity, it is translated *dimidius*, *-a*, *-um*, *e.g.* ʒss. = drachmam dimidiam or semi-drachmam; along with another (entire) number, it is translated *cum semisse*, *e.g.* ʒiss. = drachmam cum semisse; āā (ana) means "of each the same quantity"; thus—

℞ Potassii Bromidi
Ammonii Bromidi āā drachmam.

The official dose for medicine is intended for adults, and in prescribing for children or young persons the dose must be proportionate to the age. The proportion is calculated from the following rule—divide the age (in years) by the age *plus* 12. The resulting fraction of the adult dose is suitable for the case in question.

Thus for a child of two years it will be $\frac{2}{2+12}=\frac{2}{14}=\frac{1}{7}$, making the dose $\frac{1}{7}$th of that of an adult.

If for a child of three years, $\frac{3}{3+12}=\frac{3}{15}$ths, or $\frac{1}{5}$th, etc.

Opium and its preparations act powerfully on children, and hence the dose must be reduced to a greater extent.[1] In prescribing mixtures for children the dose should seldom or never exceed a teaspoonful.

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[1] As a rule, opium should not be prescribed to children.

The directions should be such as to suit the requirements of each individual case ; thus in a mixture for diarrhœa it is usual to direct that a dose be given "after each liquid stool"; for paroxysmal cough, a dose "when the cough is troublesome," etc.

The Pharmacopœia lays down definite doses for the official groups of preparations of drugs, as in decoctions, infusions, extracts, liquors, powders, and wines, and for the convenience of prescribers a synopsis of the doses of these in common use will be given. While *exceptions* must be noted, it is well to remember the following leading principles as to the doses of drugs.

1. The preparations of drugs which are poisonous, as arsenic or antimony, or of drugs which have an alkaloid, as aconite, or an active principle, as digitalis, are given in small doses.

2. The doses of the waters, decoctions, infusions, and mixtures are as a rule from ℥i. to ℥ii. The doses of tinctures—5 to 15 m. and ʒss. to ʒi.

POSOLOGICAL TABLES

EXTRACTA (Extracts)

Solid

The following nine have a dose of ¼ to 1 gr. :—

Ext. Bellad. Alcoh.
,, ,, Viride
,, Cannabis Indicæ
,, Nucis Vomicæ
,, Colchici
Ext. Opii
,, Physostigmatis
,, Stramonii
,, Strophanthi

All the other solid extracts have a dose of 2 to 8 gr. except—

Ext. Euonymi Siccum	1 to 2 gr.
,, Aloes Barb.	2 to 4 ,,
,, Taraxici	5 to 15 ,,
,, Krameriæ	

Liquid

Ext. Ipecac. Liq.	½ to 2 m.
,, Nucis Vomicæ Liq.	1 to 3 ,,
,, Cinchonæ ,,	5 to 15 ,,
,, Hamamelidis ,,	
,, Hydrastis ,,	
,, Jaborandi ,,	
,, Cascaræ Sagradæ ,,	½ to 1 fl. dr.
,, Cocæ ,,	
,, Glycyrrhizæ ,,	

Ext. Cimicifug. Liq.	5 to 30 m.
,, Ergotæ ,,	
,, Opii ,,	
,, Pareiræ Liq.	½ to 2 fl. dr.
,, Taraxici ,,	
,, Sarsæ ,,	2 to 4 ,,

INFUSA (INFUSIONS)

The ordinary dose of infusions is ½ to 1 oz. The following are exceptions :—

Infusum Digitalis	2 to 4 fl. dr.
,, Buchu	1 to 2 fl. oz.
,, Cuspariæ	
,, Ergotæ	
,, Lupuli	
,, Scoparii	

INJECTIONES HYPODERMICÆ

Injectio Apomorphinæ Hypodermica	5 to 10 m.
,, Ergotæ Hypodermica	3 to 10 ,,
,, Cocainæ Hypodermica	2 to 5 ,,
,, Morphinæ Hypodermica	

LIQUORES (LIQUORS)

Liquor Atropinæ Sulphatis	½ to 1 m.
,, Trinitrini	½ to 2 ,,
,, Arsenicalis	2 to 8 ,,
,, Arsenici Hydrochloricus	2 to 8 ,,
,, Sodii Arsenatis	2 to 8 ,,
,, Strychninæ Hydrochloridi	2 to 8 ,,
,, Ferri Acetatis	5 to 15 ,,
,, ,, Perchloridi	5 to 15 ,,
,, ,, Pernitratis	5 to 15 ,,
,, Thyroidei	5 to 15 ,,
,, Arsenii et Hydrargyri Iodidi	5 to 20 ,,
,, Morphinæ Acetatis	10 to 60 ,,
,, ,, Hydrochloridi	10 to 60 ,,
,, ,, Tartratis	10 to 60 ,,
,, Hydrargyri Perchloridi	½ to 1 fl. dr.
,, Bismuthi et Ammonii Citratis	½ to 1 ,,
,, Ammoniæ Acetatis	2 to 6 ,,
,, ,, Citratis	
,, Magnesii Carbonatis	1 to 2 fl. oz.

The concentrated liquors have a dose of ½ to 1 fl. dr.

MISTURÆ (MIXTURES)

The official mixtures have a dose of ½ to 1 fl. oz. except—

Castor Oil, Senna, and Brandy . . . . ½ to 2 fl. oz.

OLEA (OILS)

Volatile oils have a dose of 1 to 3 m., except—

Oleum Terebinthinæ .	3 to 10 as stimulant; 2 to 4 ʒ anthelmintic.
,, Copaibæ . .	5 to 20 m.
,, Cubebæ . .	5 to 20 ,,
,, Santali . .	5 to 30 ,,

Of the fixed oils the dose of Oleum Crotonis is . .	½ to 1 m.
,, Morrhuæ . . .	1 to 4 fl. dr.
,, Ricini . . .	1 to 8 ,,

PILULÆ (Pills)

Phosphorus pill has dose of 1 to 2 gr.; soap and lead pills, 2 to 4 gr.; purgative pills, 4 to 8 gr.

PULVERES (Powders)

Pulvis—

Antimonialis .	3 to 6 gr.	*P.* Catechu Co. . .	10 to 40 gr.
Elaterini Co. .	1 to 4 ,,	Cret. Arom. c. Opio	10 to 40 ,,
Opii Co. . .	2 to 10 ,,	Cinnamomi Co. .	10 to 40 ,,
Ipecac. Co. . .	5 to 15 ,,	Cretæ Aromat. .	10 to 60 ,,
Kino Co. . .	5 to 20 ,,	Rhei Co.	20 to 60 ,,
Scammonii Co. .	10 to 20 ,,	Jalapæ Co.	

P. Glycyrrhizæ Co. 1 to 2 ʒ.

TINCTURÆ (Tinctures)

The dose of poisonous tinctures is 5-15 m.; of non-poisonous, ½ to 1 fl. dr.

Tinct. Iodi is only 2 to 5 m.

51 to 5 m. is the dose of—

Tinct. Aconiti*
,, Belladonnæ
,, Cannabis Indicæ
,, Cantharidis*
,, Capsici
,, Chloroformi et Morph. Co.
,, Cocci
,, Colchici Seminum
,, Croci
,, Digitalis
Ferri Perchloridi
Gelsemii
Lobeliæ Ætherea
Nucis Vomicæ
Opii†
Podophylli
Scillæ
Stramonii
Strophanthi

* For frequently repeated doses, 2 to 5 m.; single dose, 5 to 15 m.
† ,, ,, ,, ,, 5 to 15 ,, ; ,, ,, 20 to 30 ,,

VINA (Wines)

Vinum Antimoniale	10 to 30 m.
,, ,,	2 to 4 fl. dr. as emetic.
,, Colchici	10 to 30 m.
,, Ferri	1 to 4 fl. dr.
,, ,, Citratis	,, ,,
,, Ipecacuanhæ	10 to 30 m.
,, ,,	4 to 6 fl. dr. as emetic.

EMETICS

Zinci Sulphas	10 to 30 gr. in water.
Vinum Ipecacuanhæ	3 to 6 fl. dr.
Cupri Sulphas	5 to 10 gr. in water.
Sinapis	1 to 4 dr. in water.
Injectio Apomorphinæ Hypodermica . .	5 to 10 m.

In writing out a prescription the prescriber should proceed on certain broad intelligible principles. He should first of all consider in what form he will order a medicine, and in doing this he must consult the patient's taste or idiosyncrasy, for some patients are averse to taking pills or powders, and prefer mixtures, which, in many instances, from their inherent bitterness, require to be made sweet. Sweetness in most cases may be accomplished by adding to a mixture glycerin or syrup, or a solution of saccharin —℞ Saccharini gr. v., sodii carbonatis gr. iii., sp. rect. m. xv., aquæ m. cxxvii. M.—1 gr. in 30 m.

With reference to correcting the bitterness of certain tinctures and other medicines, we have found by a series of trials that this will be effected by the saccharin solution in the following proportions :—Quassia, calumba, chiretta, cinchona, and cinchon. co., 15 m. of these tinctures will be disguised by 20 to 30 m. of the solution ; cascarilla, gentian co., 15 m. of these by 5 to 10 m. ; quinine and nux vomica, 15 m. by 40 to 60 m., but the result in comparison with others is not so satisfactory ; sodii salicylas, 15 grs. by ʒiss., or salicin or salicylic acid, 15 grs. by ʒii.

60 m. of the solution effectually take away the excessive bitterness of an equal proportion of the liquid extract of cascara sagrada.[1]

It would simplify the writing of prescriptions and render them much more accurate if each prescriber ordered one dose of a medicine. Thus in powders, where it is desirable to give an alterative for a child of five years he would naturally fix on a combination of hydrargyrum c. cretâ, sodii carbonas, and pulvis rhei. As—℞ Hyd. c. cretâ gr. ii., sodii bicarb. gr. ii., pulv. rhei gr. iii. M.—Make six such powders. S.—One as directed.

In an alterative and aperient pill for an adult, where it is desirable to prescribe mercury with colocynth and hyoscyamus, he should write—℞ Pil. hydrarg. gr. iii., ext. colocynthidis co. gr. i., ext. hyoscyami gr. i. M.—Make six such pills. S.—One as directed.

In prescribing a mixture the same plan should be followed. The prescriber says within his own mind—I shall order arsenic with tincture of cardamoms, and infusion of quassia, as—℞ Liq. arsenicalis m. v., tinct. card. co. ʒss., inf. quassiæ ℥ss. As a mixture containing a tonic requires to be taken oftener than a pill or powder, it is necessary to order a larger quantity of the official doses of the drugs mentioned. So in writing out a prescription for a six-ounce mixture, it is necessary to multiply the doses by twelve, the number of half-ounce or tablespoonful doses in a six-ounce mixture, as—℞ Liq. arsenicalis ʒi., tinct. card. co. ʒvi., inf. quassiæ ad ℥vi. M. S.—One tablespoonful thrice daily after food.

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[1] Dr. L. R. Sutherland conducted these experiments with saccharine under my superintendence.

The mental arithmetic—such a bugbear to beginners—is thus minimised, and prescription writing in time becomes easy and accurate. Based, however, on no distinct plan, it is apt to become slipshod and careless. It is also to be remembered that the success of the practitioner in daily practice is meted to him, not by his knowledge of "ologies," but by his acquaintance with disease and the remedies he can use.

Some errors creep into prescriptions from haste, carelessness, or ignorance, and we shall allude to a few of these. Thus distilled water is spelt with an *i* in English, but with an *e* in Latin. Yet a very common error is to write *aquæ distillatæ* at the end of a prescription instead of *aquæ destillatæ.* It is bad Latin, if say one drachm is ordered, to place the accusative singular of unus, and to write drachmam unam, for the unam is best left understood. When two drachms are ordered, the accusative of duo must be given, which is duas if agreeing with drachmas, and duo if agreeing with grana.

In the last line of a prescription the error of writing *aquam* instead of *aquæ* may be pardoned in a student, but this inelegant Latin, occurring in a text-book of medicine or of materia medica, has to be judged by a different standard. If the rendering of prescriptions be correctly interpreted, *aquam* grates on the ear like a false note of music. The other quantities are given in the genitive, and to make a harmonious and accurate whole *aquæ* is proper Latin, while *aquam* is not. Old writers never erred in this respect.[1]

Another common mistake is to write "spiriti" as the genitive of "spiritus": this is a noun of the fourth declension, and its genitive is thus "spiritūs." Some nouns are declined irregularly: thus the genitive of calomel is "calomelanos" (nom. "calomelas").

We shall now refer to and point out errors in prescriptions containing well-known drugs:—

Strychnine.—Strychnine is often employed as a tonic in cases of nervous debility, or in recovery from acute disease. It is made up in the form of liquor, as "liquor strychninæ hydrochloridi," in the last Pharmacopœia, thus indicating that it is dissolved in an acid, the acid being dilute hydrochloric acid. The dose is 2 to 8 minims = $\frac{1}{55}$ to $\frac{1}{14}$ grain of strychnine. In former Pharmacopœias it was simply termed "liquor strychniæ," and perhaps on account of this prescriptions have been ignorantly written where the liquor was combined with an alkali—℞ Liq. strychniæ ʒii., potass. bicarb. ʒss., aq. ad ℥iv. M. This is manifestly wrong, and so also is the combination of liq. arsenicalis with liq. strychniæ—℞ Liq. arsenicalis ʒii., liq. strychniæ ʒii., aq. ad ℥i. M. S.—10 drops twice daily after food. When dispensed, this is a seemly mixture, but a reaction occurs, the alkaline carbonate in liq. arsenicalis neutralising the hydrochloric acid in liq. strychn. hydrochlor., and consequently the alkaloid falls to the bottom in fine crystals, especially if the mixture is exposed to cold. An over-dose of such a powerful drug as strychnine is a serious matter, and the following mixture, if taken as written, would undoubtedly have caused symptoms of poisoning :—℞ Acidi sulphurici diluti ʒii., liquoris strychniæ ʒss., aquæ ad ℥ii. M. S.—A teaspoonful in water as directed. When the prescriber's attention was directed to this he substituted the liquor he intended—viz. extractum ergotæ liquidum, the maximum dose of which is 30 minims. Although liquor strychn. hydrochlor. has no synonym, and liquor arsenicalis has, the following jumbled-up prescription has come under my notice :—℞ Liquor. strychniæ (Fowler's solution) ʒi., tinct. ferri perchloridi ʒii., aquæ ad ℥vi. M. —A teaspoonful thrice daily.

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[1] This question was referred to three professors of Latin in different universities, who all stated that *aquæ* was correct.

Tincture of Digitalis and Iron Preparations.—Tincture of digitalis is frequently prescribed with the tincture of perchloride of iron—*e.g.* ℞ Tinct. digitalis ʒii., tinct. ferri perchlor. ʒii., aq. ad ℥vi. M. S.—A tablespoonful thrice daily. Dispensed as by the formula, a muddy mixture results, in no sense however, as experience shows, untherapeutical, though somewhat unseemly. If, however, the water is added to the tinct. digitalis, and afterwards the tinct. of the perchloride, this unseemliness does not occur, and the mixture has no deposit.

Bismuth and Alkaline Preparations.—The subnitrate of bismuth is an excellent stomachic, sedative, and astringent, and it is sometimes ordered with sodium and potassium bicarbonate, as—℞ Sodii vel potassii bicarb. bismuthi subnitrat. āā ʒii., mucil. tragacanthæ ʒiii., aquæ ad ℥vi. M. S.—Half a tablespoonful twice daily. A reaction here occurs between the bicarbonate and subnitrate of bismuth, carbonic acid being at the same time given off. The action is not immediate but occurs slowly, so that awkward results may follow from bursting of the bottle, especially if the patient has to make a journey and places the bottle among his clothes. Any untoward result here may be avoided by using hot water in dispensing, when immediate completion of the reaction occurs; or better still, bismuthi carbonas may be prescribed instead of bismuthi subnitras. ℞ Liquor. bismuthi ʒi., tinct. kino ʒiv., mist. cretæ ad ℥iv. M.—A dessertspoonful thrice daily. The liq. bismuthi and tinct. kino combined form an unsightly clotted mass; a better result is obtained by adding the liq. bismuthi last. Some misconception exists with regard to the suspension of bismuth. Mucilage of acacia has been employed, and answers fairly well if the mixture—say for diarrhœa of children—is given in small bottles and used in the course of twenty-four hours; if kept long the bismuth settles down and cannot be properly suspended by shaking. Mucilage of tragacanth contains now in the British Pharmacopœia rectified spirit, and suspends the bismuth for any length of time. The same suspension is also produced when pulvis tragacanthæ compositus is employed, carefully mixing the powders together in a mortar with a pestle, then adding water or other vehicle, and transferring the mixture to a bottle.

Perchloride of Mercury, Iodide of Potassium, and Infusion of Cinchona.—℞ Liq. hydrarg. perchlor. ʒii., potassii iodidi ʒi., inf. cinchonæ ad ℥vi. M. S.—Half an ounce thrice daily. The mixture of perchloride of mercury and iodide of potassium produces potassio-mercuric iodide, or "Mayer's reagent" for the detection of alkaloids, and, when added to the infusion of cinchona, causes a complete precipitation of all the cinchona alkaloids in the form of double iodides of mercury and the alkaloids. Infusion of quassia, which contains no alkaloid, may be prescribed, but *no infusion containing any alkaloid is admissible.*

Perchloride of Mercury and Liquor Strychninæ.—℞ Liq. hydrarg. perchlor. ʒii., liq. strychninæ hydrochlor. ʒiss., aquæ ad ℥ii. M. S. —One teaspoonful thrice daily. This mixture is open to the same objection as the preceding, all the strychnine being precipitated as double chloride, having the formula $(C_{21}H_{22}N_2O_2HCl)_2HgCl_2$.

Perchloride of Mercury and Tincture of Calumba.—℞ Liq. hydrarg. perchloridi ʒiii., tinct. calumbæ ad ℥ii. M. S.—One teaspoonful in water after meals. This mixture slowly lets fall a yellow precipitate of double chloride of mercury and berberine.

Iron Preparations.—It is well known that the liquid preparations of iron can only be prescribed with two infusions—quassia and calumba. When other infusions are used a black or muddy mixture ensues. The tincture of the perchloride of iron, from its excellent tonic qualities, naturally suggests its being prescribed with iodide of potassium, which salt, valuable as an alterative, has also a tendency to cause weakness and loss of strength, thus:—℞ Tinct. ferri perchlor. ʒss., potassii iodidi ʒii., decoct. sarsæ co. ad ℥viii. M. S.—A tablespoonful thrice daily after food. The potassium iodide reduces the ferric chloride to ferrous chloride, with the formation of potassic chloride and free iodine according to the following equation:—

$$Fe_2Cl_6 + 2KI = 2FeCl_2 + 2KCl + I_2.$$

℞ Tinct. ferri perchloridi ℥ss., acid. phosph. dil. ʒvi., infus. quassiæ ad ℥vi. M. S.—A dessertspoonful three times daily. Made up according to this prescription there is a precipitate of ferric phosphate. But the mixture may be rendered elegant and useful by redissolving the precipitate with the addition of a little hydrochloric acid.

Alkaline Preparations.—In some forms of dyspepsia with acidity, it may be deemed advisable to prescribe the bicarbonate of sodium with a bitter infusion, thus:—℞ Sodii bicarb. ʒii., infus. cinchonæ ad ℥vi. M. S.—To be taken as directed. According to the old Pharmacopœia this is a perfectly good prescription, as no acid was employed, but the new Pharmacopœia directs for infusion of cinchona the red cinchona bark to be made up with aromatic sulphuric acid, and hence the acid and the alkali form an incompatible mixture. The alkali may, however, be prescribed with tinctura cinchonæ, in which there is no acid.

It may be considered advisable to prescribe quinine with bicarbonate of potassium, as—℞ Potass. bicarb. ʒii., quininæ sulph. ʒss., acid. sulph. dil. q.s., aquæ ad ℥vi. M. S.—A tablespoonful thrice daily.

Here it is impossible to add acid to dissolve the quinine, and at the same time to have an alkali in the mixture. The difficulty may, however, be solved by rubbing the potass. bicarb. and quin. sulph. together, and adding the water gradually. In this way a presentable creamy mixture results.

Another incompatible alkaline mixture is the combination of potassium (or sodium) bicarbonate with magnesium sulphate; the former being by constitution an acid salt, the following reaction slowly occurs—

$$2KHCO_3 + MgSO_4 = MgCO_3 + K_2SO_4 + H_2O + CO_2.$$

Again, the physician should be careful not to prescribe the *carbonate* of potassium or sodium when he intends the *bicarbonate* to be given ; carbonate of potassium (salt of tartar) and carbonate of sodium (washing soda) have an irritant and even caustic action on the mucous membrane of the alimentary tract, and are unsuitable for internal administration.

Iodide of Potassium.—A common error is to prescribe iodide of potassium with sp. ætheris nitrosi. The sp. ætheris nitrosi always contains free nitrous acid, which instantly liberates free iodine with production of nitric oxide gas, thus :—℞ Potassii iodidi ʒi., sp. ætheris nitrosi ℥ss., aquæ ad ℥vi. M. S.—A tablespoonful every three hours. The mixture can be obtained perfectly correct if sufficient bicarbonate of potassium is added to neutralise the spiritus ætheris nitrosi previous to combining it with the iodide of potassium. Potassium iodide in solution soon becomes partially decomposed with the liberation of free iodine, thus mixtures containing it should be calculated to last only for a few days at most.

Permanganate of Potassium.—Permanganate of potassium may be prescribed in a pilular form with kaolin ointment, or it may be given in the two-grain lozenges of Wyeth of Philadelphia. It cannot be prescribed with syrup or glycerin, or any other oxidisable substance, as—℞ Potassii permangan. gr. ii., syrupi q.s. M. —Make a pill ; one such thrice daily. Similarly also oxide of silver cannot be prescribed with creosote, for deflagration takes place. If creosote is previously mixed up with curd soap this will be avoided, but the two drugs should not, without this precaution, be prescribed together.

Argenti nitras is frequently prescribed with crumb of bread, as— ℞ Argenti nitratis gr. ii., micæ panis q.s. Divide into twelve pills. 170 gr. of nitrate of silver are decomposed by 58·5 gr. of chloride of sodium, and this reaction occurs in the pill mass mentioned. The nitrate is ultimately turned into chloride when it reaches the stomach, but then it is in a nascent state. Wheaten flour or fine siftings may be prescribed with silver in a pilular form, or, according to Squire, kaolin ointment. Oxide of silver should also be prescribed in pill with kaolin ointment: vegetable extracts reduce it with deflagration, especially if much friction be used.

Phosphorus and Cod-Liver Oil.—The advantage of combining cod-liver oil with phosphorus preparations is great in tubercular or rickety conditions. A dangerous combination occurs when phosphorated oil is prescribed directly with ol. morrhuæ, as—℞ Ol. phosphorati ♏cxliv., ol. morrhuæ ad ℥xxiv. M. S.—A tablespoonful three times a day. Phosphorus is here liable to separate, and poisoning may ensue. The danger is aggravated when phosphorus is put into the oil in small quantities and left to dissolve; this it does not do, but remains undissolved. Cod-liver oil should be acted on by ether, as oil of almonds is, before adding the phosphorus.

Cough Mixtures.—A common error in cough mixtures is to prescribe carbonate of ammonium with syrup of squills. This is done through ignorance of the fact that the syrup of squills is prepared from the acetum scillæ:—℞ Ammon. carb. ʒi., vin. ipecac. ʒii., syr. scillæ ℥ss., infus. senegæ ad ℥vi. M. S.—Half an ounce three times a day in water. Ammonium acetate is from this prescription formed with the liberation of carbonic acid. Tinctura scillæ would be compatible, with syrup to sweeten the mixture.

Polypharmacy.—All practitioners who feel inclined to huddle drugs together into a mixture should remember the ludicrous conception of a Chinese mandarin, who, when ill, was wont to summon twelve physicians, and to take all the medicines prescribed, so that in the midst of such a profusion of shot one missile might hit the mark. When a prescription has more than four ingredients, patients become curious as to the one on which efficacy depends. A case is related where a prescription for asthma contained a number of drugs, and was valuable when other remedies had failed. The patient had each drug of the prescription made up with water and took it. By so doing he lighted upon the basis of the cure, which in this case was the iodide of potassium.

As a summary, with regard to prescribing, we may say—

(*a*) Write distinctly.

(*b*) Beware of incompatibility in direct alkaline and acid substances, as sodii bicarb. and acid. sulph. dil., and when acids or alkalies are embodied in the pharmacopœial preparations, as

ACIDS.

Acetum cantharidis.
Acetum scillæ.
Extractum colch. aceticum.
Oxymel scillæ.
Syrupus scillæ.
Succus limonis.
Syrup. limonis.
Liquor ferri pernit.
Tinct. ferri perchlor.
Liquor strychninæ hydrochloridi.
Infusum rosæ acidum.
Infusum cinchonæ acidum.

ALKALIES.

Sp. ammon. aromat.
Sp. ammon. fœtidus.
Tinct. opii ammoniata.
Tinct. guaiaci ammoniata.
Tinct. valerian. ammoniata.
Decoctum aloes co.
Liquor arsenicalis.

(*c*) Do not combine medicines physiologically incompatible, as strychnine and chloral.

(*d*) Indicate incompatibility, absolute or pharmaceutical, when intentionally an acid is mixed with a carbonate. In this case see, by warming if necessary, that carbonic acid is liberated.

(*e*) Generally leave the excipient to the dispenser, and never prescribe more of a soft extract than there is of a solid ingredient.

(*f*) When substances which are only sparingly soluble in water are prescribed in a mixture, see that sufficient water or other solvent is employed to dissolve the whole. It is common to observe such a mixture as the following prescribed—

℞ Potass. Chlorat. ʒiv.
Aquæ ℥iv. S.

The result of this is that more than half of the salt remains undissolved. Among other substances which are even more sparingly soluble in water are benzoic, boracic, gallic, and salicylic acids, antifebrin, croton-chloral hydrate, citrate of caffeine, exalgine, carbonate of lithium, bitartrate of potassium (cream of tartar), salicin, sulphonal, valerianate of zinc.

(*g*) Do not use contractions if there can be any doubt, from the handwriting, as to the substance intended; write then in full. If this be not attended to, hyd. chlor. may be carelessly dispensed as hyd. perchlor. (corrosive sublimate), or even as hydrate of chloral.

(*h*) The directions should be in English, and in every case very plain and legible. Ludicrous interpretations of illegible writing have been noted. Thus on a label has been inscribed, "Gargle a whole and drink a half teaspoonful every four hours." The writing was here misapprehended; the intention was to direct "George a whole and David a half teaspoonful every four hours," referring to the respective doses to be taken by two members of the same family.

METRIC SYSTEM

The metric system of weights and measures has come largely into use of late years. On the Continent it has been long employed to the exclusion of all others, while in America it seems to be rapidly displacing the older methods. Its uniformity, the extent to which it has been adopted in other countries, its decimal character, and the avoidance of reductions (as from feet to inches, and so on), confer on it undeniable advantages, not only in scientific calculations but in trade transactions of almost all kinds. The student should therefore be acquainted with it, otherwise many matters in foreign scientific works will be to him unintelligible. The tables given below show the relation of the metric to the English weights and measures.

MEASURES OF LENGTH

Millimètre	0·001 of a mètre	0·03937 inch.	
Centimètre	0·01 ,,	0·3937 ,,	
Décimètre	0·1 ,,	3·9377 inches.	
Mètre	. . . .	39·3779 ,,	
Décamètre	10 mètres	393·7790 ,,	= 32 ft. 9·7 in.
Hectomètre	100 ,,	3937·7900 ,,	= 328 ft. 1·07 in.
Kilomètre	1000 ,,	39377·9000 ,,	= 1093·633 yds.
Myriamètre	10000 ,,	393779·0000 ,,	= 6·213 miles.

The English inch = 2·539 centimètres, or 0·025 mètre.
,, foot = 3·0479 décimètres, or 0·304 mètre.
,, yard = 0·9143 mètre.
,, mile = 1·6093 kilomètre.

WEIGHTS

Milligramme	0·001 of a gramme .	0·015 grain.	
Centigramme	0·01 ,,	0·154 ,,	
Décigramme	0·1 ,,	1·543 ,,	
Gramme	. . . . .	15·432 grains.	
Décagramme	10 grammes	154·323 ,,	
Hectogramme	100 ,,	1543·234 ,,	= 0·22 lb. av.
Kilogramme	1000 ,,	15432·348 ,,	= 2·204 ,,
Myriagramme	10000 ,,	154323·488 ,,	= 22·046 ,,

The English grain = 6·479 centigrammes, or 0·064 gramme.
,, drachm = 3·84 (or nearly 4) grammes.
,, ounce (avdp.) = 28·349 grammes.
,, ounce (troy) = 31·103 ,,
,, pound (avdp.) = 453·592 ,,

MEASURES OF CAPACITY

Millilitre or	1 cubic centimètre	0·061 cubic inch.
Centilitre	10 ,, centimètres	0·610 ,, ,,
Décilitre	100 ,, ,,	6·102 ,, inches = 0·176 pt.
Litre = cubic decimètre . .		61·027 ,, ,, = 1·76 ,,
Décalitre		17·607 pints = 2·2 gallons.
Hectolitre		22·009 gallons.
Kilolitre = cubic mètre . .		220·09 ,,
Myrialitre		2200·96 ,,

The English cubic inch = 16·386 cubic centimètres.
,, ,, ,, foot = 28·315 cubic décimètres.
,, ,, gallon = 4·543 litres.

Prescribing will be facilitated by bearing in mind the following *approximate* equivalents :—

M. i. or gr. i.	= 0·06 cubic centimètre	or 0·06 gramme.	
M. xv. or gr. xv.	= 1 ,, ,,	or 1 ,,	
F. ʒi. or ʒi.	= 4 ,, centimètres	or 4 grammes.	
F. ℥i. or ℥i.	= 32 ,, ,,	or 32 ,,	

The gramme and the cubic centimètre, when referring to liquids, may be regarded as equal, except when the liquids are very heavy or very light.

An ordinary teaspoon holds about 5 cubic centimètres, an ordinary tablespoon about 20 c.c.

100 grms. or c.c. of water make about 20 teaspoonfuls, or 5 tablespoonfuls.

The following is an example of a prescription calculated according to both styles :—

℞ Pepsinæ (B.P.) . .	ʒi. . . .	4	00 grm.
Acid. Hydrochlor. dil.	ʒiss. . .	6	00 c.c.
Syr. Aurant. . .	℥i. . . .	32	00 c.c.
Inf. Calumbæ ad .	℥viii. (M) .	ad 250	00 c.c. (M.)

A line is frequently used instead of the decimal points, as being less likely to give rise to errors.

Powders, pills, and similar preparations are ordered in the metric system in the following manner :—The prescription for pills or powders is based upon ordering fifteen, then each grain desired in a single pill will correspond with one gramme of the sum total.

Recipe—Potassii Bicarbonatis (gr. ii. in each powder) 2 grm.
Pulveris Cinnamomi Compositi (gr. iv. in each powder) 4 grms.
Bismuthi Subnitratis (gr. vi. in each powder) 6 grms.
Misce.—Divide into xv. powders.

For the sake of simplicity in prescriptions, it is well to order of the powder a number which is either a factor or a multiple of a factor of 15.

Recipe—Calomelanos gr. i. in each powder=
grm. i., less $\frac{1}{3}$=grm. $\frac{2}{3}$ . . . =0 | 66 grm.
Pulveris Rhei gr. vi. in each powder=
grm. vi., less $\frac{1}{3}$=grm. iv. . . =4 | 00 ,,
Pulveris Cretæ Præparatæ gr. iii. in each
powder=grm. iii., less $\frac{1}{3}$=grm. ii. =2 | 00 ,,
Misc.—Divide into ten powders (15 $-\frac{1}{3}$ of 15=10).

In ordering dry preparations of powders or pills, a slight error should not be overlooked, viz. for every grain we order in a dose we get a larger quantity than this, *e.g.* $1\frac{1}{35}$ grain, since 1 gramme equals 15·432 grains.

Thermometric Scales

In the Centigrade (or Celsian) scale, used universally in Continental works on Medicine, the freezing point of water is taken as zero, and the distance from it to the boiling point of water is divided into 100 degrees; Fahrenheit's scale, on the other hand, begins at 32 degrees below the freezing point of water, from which latter to the boiling point of water it is divided into 180 degrees. So that in the Centigrade scale the freezing and boiling points of water are 0° and 100° respectively, in Fahrenheit's scale 32° and 212°. Degrees Fahrenheit therefore bear to degrees Centigrade the relation of 180 to 100, that is, 9 to 5; but in calculating, the extra 32 degrees of Fahrenheit's scale must be kept in mind, and must be first subtracted in converting F. into C., and added, after multiplying and dividing, in converting C. into F. The rules will therefore stand thus: To convert degrees F. into degrees C., first subtract 32°, and then multiply by 5 and divide by 9; to convert degrees C. into degrees F., multiply by 9, divide by 5, and add 32°. Example:

Reduce 98·4° F. to degrees C.

98·4 − 32 = 66·4
66·4 × 5 = 332·0
332·0 ÷ 9 = 36·8° C.

Convert 39·5° C. into degrees F.

39·5 × 9 = 355·5
355·5 ÷ 5 = 71·1
71·1 + 32 = 103·1° F.

I.—ALTERATIVES AND RESOLVENTS[1]

Hydrargyrum et Potassii Iodidum.

1. Recipe—Hydrargyri Perchloridi granum, Potassii Iodidi drachmas tres, Liquoris Sarsæ Compositi concentrati ad uncias sex. Solve et Misce.

Signa—A tablespoonful thrice daily after food.

Mercury and Gentian.

2. ℞ Hydrarg. Perchlor. gr. i., Ext. Gentian. grs. xviii. M.—Divide into twelve pills; one thrice daily.

Useful in secondary syphilis.

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[1] The first prescription in each division of remedies is printed in unabbreviated Latin.

Perchloride of Mercury Injection (Bloxam's).

2a. ℞ Hydrarg. Perchlor. gr. xxxii., Ammonii Chloridi gr. xvi., Aquæ Destill. ad ℥ii. M.—Dose 10 m. = ⅓ gr. of Perchloride of Mercury.

In Syphilis.

Donovan's Triple Solution.

3. ℞ Liquoris Arsenii et Hydrargyri Iodid. ʒiij., Tinct. Zingib. ʒiij., Aquæ ad ℥vj. M.—A tablespoonful thrice daily after food.

Useful in secondary syphilis and some skin eruptions.

Perchloride of Mercury and Chloride of Sodium.

3a. ℞ Hydrarg. Perchlor. gr. i., Sodii Chloridi ʒss., Glycerini ℥iss., Aq. Destill. ℥iiss. M. et S.—One teaspoonful every two hours, preceded by a free drink of water.

Recommended by Jacobi in diphtheria.

Arsenic and Cinchona.

4. ℞ Liquor. Arsenicalis ʒi., Tinct. Cardamom. Co. Tinct. Cinchonæ āā ʒiii., Aquæ ad ℥vi. M.—A tablespoonful thrice daily after food.

Useful in various skin affections, chorea, chronic cerebral congestion.

Iodide of Potassium and Calumba.

5. ℞ Potass. Iodid. ʒij., Infus. Calumbæ ℥vj. S.—A dessertspoonful thrice daily.

Useful in various diseases, syphilitic or otherwise.

Phenazonum, Sodii Iodidum, Sodii Salicylas.

5a. ℞ Sodii Iodidi, Sodii Salicyl., Phenazoni āā gr. 60, Sp. Ammon. Aromat. ʒiii., Aquæ ad ℥vi. M.—A tablespoonful to be taken in a claret-glassful of potash or Lithia water every four hours.

Useful in sciatica, chronic rheumatism, neuralgia.

Colchicum, Digitalis, Colocynth.

5b. ℞ Ext. Colchici gr. ½, Digitalis (Pulv.) gr. ½, Ext. Colocynth. Co. gr. i. M.—Twelve such (white coating). S.—One each night at bedtime.

Recommended by Dr. Phillips in gouty cases, with feeble heart, especially if diuresis is required.

Guaiacum Mixture.

6. ℞ Tinct. Guaiaci Ammon. ʒiij., Tinct. Aconiti m. xx., Mucil. Acac. ʒj., Aquæ Camph. ad ℥vj. M.—Two tablespoonfuls thrice daily.

Recommended in Cynanche tonsillaris and some skin affections.

Guaiacum, Iodide of Potassium, and Colchicum.

6a. ℞ Pulv. Guaiaci, Potass. Iodid. āā gr. 120, Tinct. Colch. Sem. ʒiii., Aq. Cinnamomi, Syrupi āā q.s. ad ℥vi. S. et M.—A dessertspoonful or a tablespoonful thrice daily.

Useful in chronic rheumatism.

Salicylic Acid in Small-Pox.

6b. ℞ Acidi Salicylici gr. xx., Sodii Bicarb., Ammon. Carb. āā gr. iv. M.—To be taken in water every two or three hours in the early stage of small-pox; or, in the later stages, with the addition of 5-grain doses of the Citrate of Iron and Ammonia.

Carbolic Acid.

6c. ℞ Acidi Carbolici, Glycerini, Gelatini āā ʒi., Aquæ ℥xxi. M.—As soon as small-pox pustules form, prick them, and apply this lotion. Patient should also take a warm bath daily.

Chlorate of Potassium.

7. ℞ Potass. Chlorat. ʒij., Glycerini ℥j., Aquæ Camph. ad ℥viij. S. et M.—A tablespoonful every four hours.

Recommended in inflammatory affections of the mouth, etc.

Salacetol.

7a. ℞ Salacetol (Morson) gr. 20 to 40 in powder—12 such. S.—One powder to be taken 2 or 3 times daily in a wine-glassful of water.

Recommended in some obstinate cases of sciatica and neuralgia.

Mercury, Rhubarb, and Soda.

8. ℞ Hydrarg. c. Cretâ gr. ij., Pulv. Rhei gr. ij., Soda Bicarb. gr. iij. M.—Make a powder. One at bedtime.

Recommended in various infantile or children's diseases.

Zittmann's Decoction (Strong).

Decoctum Zittmanni Fortius.

8a.[1] 420·0, Sarsaparilla Root, with 30 kilogrammes of water, are macerated for twenty-four hours; then Alum is added 25·0, Calumb. 2·5, Cinnab. 4·5, and the decoction is boiled until 10 kilogrammes result. Anise Seeds 15·0, Senna 100·0, Liquorice Root 50·0, are added, and the whole boiled, pressed, and strained.

Decoctum Zittmanni Mitius.

The root and branches of Sarsaparilla 230·0 and 30 kilogrammes of water are boiled down to 20 kilogrammes; then Cortex Citri, Cassia, Cinnamon, Cardamoms, Liquorice Root, of each 12·0, are added, boiled, and the whole pressed.

Of the strong decoction, a dessertspoonful may be taken thrice daily. Of the weak decoction, a tablespoonful thrice daily.

Recommended specially by German authorities in constitutional syphilis.

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[1] The weights here indicated are in *grammes*.

Merck's Desiccated Thyroidin.

8*b*. ℞ Thyroidini Siccati ʒss., Terræ Siliciæ et Muc. Trag. q.s. M.—Divide into 20 pills. Dose 1-3-6 pills daily; or ℞ Thyroidini Siccati ʒss., Sacchar. Lactis ʒivss. M.—Divide into 20 Trochisci. Dose 1-6 pastilles daily.

In Myxœdema.

II.—ANTACIDS

Bismuthum, Acidum Hydrocyanicum Dilutum, etc.

9. Recipe—Liquoris Bismuthi et Ammonii Citratis unciam dimidiam, Acidi Hydrocyanici Diluti minima quadraginta, Tincturæ Cardamomi Compositæ drachmas tres, Spiritus Chloroformi drachmam cum semisse, Aquæ ad uncias sex. Misce.

Signa—A tablespoonful thrice daily before food.

Recommended in dyspepsia, for vomiting and pain in gastric ulcer, and in hooping-cough.

Ammonia, Potash, and Chiretta.

10. ℞ Ammon. Carbon. ʒi., Potass. Bicarb. ℥iss., Inf. Chiratæ ad ℥vi. S.—A tablespoonful thrice daily before food.

Useful for the acid eructations of dyspepsia and debility.

Magnesia and Soda.

11. ℞ Magnes. Levis ʒss., Sodii Bicarb. gr. xx., Tinct. Aurantii ʒss., Aquæ Menth. Pip. ℥i. M.—The draught; for heartburn, etc.

Creosote.

11*a*. ℞ Creosoti m. i., Tinct. Camph. Co. m. 30, Spirit. Chloroform. m. 15, Glycerini ʒi., Aquæ ℥i.

In vomiting or heartburn.

Salicylic Acid Mixture.

11*b*. ℞ Acidi Salicylici drachmas duas, Potassii Acetatis drachmas quatuor cum semisse, Aquæ ad uncias sex. S.—A tablespoonful every three hours.

Given by some in acute rheumatism, as combining the Salicylate and Alkaline treatment.

The following *tabloids* are useful in some cases of dyspepsia: Pepsin 1 gr., Bism. Carb. 2 grs., Carb. Lign. 2 grs.; Pepsin, Pure, 1 gr., Calcii Lactophos. 1 gr.; Sodii Bicarb. 4 grs., Ammon. Carb. $\frac{1}{8}$ gr., Ol. Menth. Pip.; Papain, 2 grs.

III.—ANTIPYRETICS

Liquor Ammonii Acetatis, Spiritus Ætheris Nitrosi.

11*c*. Recipe—Liquoris Ammonii Acetatis unciam dimidiam, Spiritus Ætheris Nitrosi, Tincturæ Hyoscyami ana drachmas tres, Aquæ Camphoræ ad uncias sex. Misce.

Signa—A tablespoonful every two hours. Used as an antipyretic at the commencement of Febricula.

11*d*. ℞ Sulphatis Quininæ gr. xxx.

Suspended in milk, this powder is sometimes ordered to reduce temperature in typhoid fever.

Injectio Sulphatis Quininæ.

11*e*. ℞ Quininæ Sulphatis gr. xxxvi., Acidi Tartarici gr. xv., Aquæ ℥ss. 20 drops as a hypodermic injection contain 3 grains of Sulphate of Quinine. This injection causes no abscesses, and is useful in fever.

Salicin.

11*f*. ℞ Salicini gr. xxv. One powder in milk every two hours in acute rheumatism.

OFFICIAL ANTIPYRETICS

The following tablets are useful: Caffein and Antipyrin. Antipyrin 2½ and 5 grs. Phenacetin (Bell's Lozenge) 5 grs.

IV.—ANTISPASMODICS

Lobelia, Æther.

12. Recipe—Tincturæ Lobeliæ Æthereæ drachmam cum semisse, Spiritus Ætheris drachmas tres, Tincturæ Conii drachmas duas, Misturæ Ammoniaci ad uncias sex. Misce. Signa—A tablespoonful every three hours.

Useful in asthma and paroxysmal coughs.

Cardamoms and Ammonia.

13. ℞ Acid. Hydrocyan. dil. m. xl., Spt. Ammon. Aromat. ʒij., Tinct. Card. Co. ʒiv., Tinct. Zingib. ʒiij., Spt. Chloroform. ʒij., Aquæ Carui ad ℥vj. M.—A tablespoonful to be taken occasionally.

For flatulence or colic.

Valerian and Asafetida.

14. ℞ Tinct. Valerian. Ammon., Tinct. Asafet. āā ʒvi., Tinct. Lavand. Co. ʒiss., Pulv. Trag. Co. ʒi., Aquæ ad ℥vi. M.—A tablespoonful every three hours.

For hysteria, etc.

Chloral, Bromide of Potassium, and Morphine.

14*a*. ℞ Chloral Hydratis, Potass. Bromid., Potass. Bicarb. āā ʒi., Liq. Morph. Hydrochlor. ʒi., Aquæ ad ℥vi. S. et M.—A small tablespoonful every three hours.

Gibb's Nitric Acid Mixture.

15. ℞ Acid. Nitric. dil. ʒxij., Tinct. Card. Co. ʒiij., Syrup. ʒiiss., Aquæ ℥iv. M.—A small teaspoonful every two hours.

For hooping-cough.

Dr. Fuller's Belladonna Mixture.

15*a*. ℞ Zinc. Sulphat. gr. viii., Ext. Belladon. gr. vii., Aq. ℥iv. S.—A teaspoonful four times daily, and increased by one dose daily to a child above three years old.

V.—ASTRINGENTS

Acidum Sulphuricum Dilutum cum Tincturâ Opii.

16. Recipe—Acidi Sulphurici Diluti drachmas duas cum semisse, Tincturæ Opii drachmam, Spiritûs Chloroformi drachmas duas, Aquæ Menthæ Piperitæ ad uncias sex. Misce.
Signa—A tablespoonful after every liquid stool, in diarrhœa.

Catechu, Opium, and Chalk.

17. ℞ Tinct. Catechu ʒiij., Tinct. Opii ʒj., Pulv. Cinnam. Co. ʒiss., Mist. Cretæ ad ℥vj. M.—A tablespoonful after every liquid stool; for adults.
For excessive diarrhœa of typhoid fever.

Chalk-Mixture, Cinnamon, and Opium.

18. ℞ Tinct. Opii m. x., Pulv. Cinnam. Co. ʒj., Mist. Cretæ ʒvi., Aquæ Cinnamomi ad ℥iv. M.—A teaspoonful may be given every hour.
For diarrhœa of children, and in chronic dysentery.

18*a*. ℞ Ol. Anisi, Ol. Cajuputi, Ol. Juniperi āā ʒss., Æther. ℥ss., Liq. Acid. Halleri ʒss.,[1] Tinct. Cinnamom. ℥ii. M.—Ten drops every quarter of an hour in a little water. An opiate may be given with the first and second dose.
Used to promote reaction in cholera and diarrhœa.

Gallic Acid.

19. ℞ Acid. Gallici gr. x., Aquæ ℥iss. S.—To be taken every four hours.
Useful in hæmoptysis and various hæmorrhages, and in chronic dysentery.

Lead and Opium.

19*a*. ℞ Pil. Plumb. cum Opio (gr. v.) xii.
Sig.—One after every stool in diarrhœa of typhoid fever, if stools exceed four daily.

Bismuth Mixture.

20. ℞ Bismuth. Subnitrat. ʒi., Pulv. Tragacanthæ Co. ʒi., Glycerini ad ℥vi. M.—A tablespoonful every three hours.
Useful in diarrhœa of phthisis.

Cascarilla, Squill, and Dilute Sulphuric Acid.

21. ℞ Tinct. Scillæ ʒiss., Acid. Sulph. dil. ʒiss., Tinct. Opii ʒss., Inf. Cascarillæ ad ℥vj. M.—A tablespoonful every three hours.
Useful in chronic bronchitis, to check excessive expectoration.

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[1] Liquor Halleri consists of one part of concentrated sulphuric acid to three parts of rectified spirit.

Starch and Laudanum Enema.

22. ℞ Tinct. Opii ʒss., Ol. Terebinth. m. x., Mucilag. Amyli ℥ii. M.
Employed to check the diarrhœa of typhoid fever, when excessive.

Salol, Bismuth, and Chlorodyne.

22*a*. ℞ Salol gr. 160, Chlorodyne B.P. m. 160, Lac. Bismuthi (Symes') ℥ii., Aquæ ad ℥vi. M.—1 to 4 drachms for a dose, according to age, every two hours.
Recommended by Dr. Anderson, Dundee, in typhoid fever.

VI.—CATHARTICS AND ANTHELMINTICS

Calomelas et Jalapa.

23. Recipe—Hydrargyri Subchloridi grana quinque, Pulveris Jalapæ grana quindecim. M.
An active purgative.

Sulphate of Magnesium and Sulphuric Acid.

24. ℞ Magnes. Sulph. ℥ij., Acid. Sulph. dil. ʒiss., Tinct. Card. Co. ʒiss., Aquæ Menth. Pip. ad ℥vj. M.—A wine-glassful every half-hour, until bowels act freely.

Aqua Purgativa (*Eau Purgative Gazeuse*).

24*a*. Crystallised Phosphate of Soda 40·0, Sod. Bicarb. 5·0, Aq. Destill. 625·0, Acid. Citric. 10·0.—A wine-glassful of this taken before breakfast forms a pleasant draught, and has an aperient action.

Aloes, Ginger, and Jalap.

25. ℞ Tinct. Jalapæ ʒvi., Syr. Zingib. ℥ii., Decoct. Aloes Co. ad ℥vi. M.—An ounce night and morning.
Useful in bilious headache and constipation.

Euonymin, Iridin, Ipecacuanha, Colocynth et Hyoscyamus.

25*a*. ℞ Euonymin gr. iss., Iridin gr. i., Ipecacuanhæ gr. ¼, Pil. Col. et Hyoscyam. gr. ii. M. Six such. S.—One pill to be taken every second night.
Recommended in habitual constipation and liver derangements.

Rhubarb, Soda, and Aloes.

26. ℞ Extract. Rhei gr. x., Sodii Phosphat. ʒj., Decoct. Aloes Co. ℥ss., Aquæ Menth. Pip. ℥j. M.
A warm aperient useful in the early stage of gout.

Elaterium and Colocynth.

27. ℞ Elaterii gr. i., Ext. Colocynth. Co. ʒss., Ext. Hyoscyam. gr. xii. Mix, and divide into twelve pills; one night and morning.
Useful in cardiac or other forms of dropsy.

Mercury and Podophyllin.

27*a*. ℞ Resinæ Podophylli gr. i., Pil. Hydrarg. gr. iii., Ext. Colocynth. Co. gr. iii., Ext. Hyoscyam. gr. ii. M.—Divide into two pills; one at bedtime.

Antimony, Sulphate of Magnesium, and Citrate of Ammonia.

28. ℞ Vin. Antimon. ʒj., Magnes. Sulphat. ℥ss., Liquor. Ammon. Citrat. ℥iss., Aquæ ad ℥vj. M.—Two tablespoonfuls twice or thrice daily.

Useful as an aperient in the early stages of various disorders.

Aloes, Nux Vomica, and Gentian.

28*a*. ℞ Ext. Aloes Barb. gr. i., Ext. Nuc. Vomic. gr. $\frac{1}{4}$, Ext. Gentian. q.s. M.—An after-dinner pill in constipation.

Filix-Mas.

29. ℞ Extracti Filicis Liquidi ʒi., Pulv. Gum. Acaciæ ʒi., Aquæ Menth. Pip. ℥i.—Make an emulsion.

Considered a specific in tapeworm.

Santonin and Syrup of Senna.

30. ℞ Santonin gr. ii., Syrupi Sennæ ʒii. M.

Recommended for expelling round-worm.

The following *cholagogue* tabloids are useful: Calomel $\frac{1}{10}$, $\frac{1}{2}$, and 1 gr.; Aloin $\frac{1}{5}$, Belladon. Ext. $\frac{1}{8}$, Strychnine $\frac{1}{60}$, P. Ipecac. $\frac{1}{16}$; Hyd. c. Cretâ 1 gr. *Cathartic* tabloids: Cascara Ext. 2 grs., plain and sugar-coated; Pil. Rhei Co. Soda and Gentian; Ext. Coloc. Co. $1\frac{1}{3}$ gr., Ext. Jalap. Pulv. 1 gr.; Hydrarg. Subchlor. 1 gr., Cambog. Pulv. $\frac{1}{4}$ gr.

Res. Podophy., Ext. Hyos., Ext. Tarax āā gr. $\frac{1}{4}$, Ext. Col. Pulv. 1 gr., Ext. Jalapæ Pulv., Res. Leptandrin āā gr. $\frac{1}{2}$, Ol. Menth. Pip.

VII.—DIAPHORETICS

Acetatis Ammonii Liquor cum Spiritu Ætheris Nitrosi.

31. Recipe—Liquoris Ammonii Acetatis unciam, Spiritus Ætheris Nitrosi unciam dimidiam, Aquæ Camphoræ ad uncias sex. Misce.

Signa—A tablespoonful every three hours.

Useful in febricular and early stages of inflammatory diseases.

Dover's Powder and Antimony.

32. ℞ Pulv. Ipecacuanhæ Comp. gr. vj., Antimon. Tartarat. gr. $\frac{1}{4}$. M.—One powder every six hours.

Guaiacum and Nitrate of Potassium.

33. ℞ Pulv. Guaiaci gr. xxx., Potass. Nitrat. gr. xv. M.—To be taken at bedtime (some warm gruel to be taken afterwards).

Useful in chronic rheumatism.

Ipecacuanha and Citrate of Ammonium.

34. ℞ Vini Ipecac. ʒiss., Syrupi ℥ss., Tinct. Camph. Co. ʒiij., Liquor. Ammon. Citrat. ʒss., Aquæ ad ℥ij. M.—A teaspoonful every two hours.

Useful in catarrhal and febrile affections of children.

Subcutaneous Injection of Pilocarpine.

34*a*. ℞ Pilocarpin. Nitratis ¼ gr., Aquæ m. x. M.—In Bright's disease, as a subcutaneous injection.

VIII.—DIURETICS

Scilla, Scoparium et Ammonii Acetas.

35. Recipe—Tincturæ Scillæ drachmas duas, Liquoris Ammonii Acetatis unciam, Infusi Scoparii ad uncias sex. Misce.

Signa—Two tablespoonfuls thrice daily.

Mercury, Squill, and Digitalis (Guy's Pill).

36. ℞ Pil. Hydrarg. gr. xxx., Pulv. Scillæ gr. vi., Pulv. Digitalis gr. xii. M.—Divide into twelve pills. One twice daily.

Useful in pleurisy or pericarditis, to remove effusion.

Digitalis, Squill, Iodide of Potassium.

36*a*. ℞ Tinct. Digitalis ʒiv., Tinct. Scillæ ʒiii., Potass. Iod. ʒii., Infusi Scoparii ad ℥vi. M. S.—A dessertspoonful thrice daily after food.

Acetate of Potassium, Squill, and Digitalis.

37. ℞ Potass. Acetat. ʒss., Acet. Scillæ ʒss., Spt. Ætheris Nitros. m. xx., Tinct. Digitalis m. v., Infusi Scoparii ℥iss. M.—The draught thrice daily.

37*a*. ℞ Potass. Acetat. ʒiij., Potass. Citrat. ʒiij., Inf. Digitalis ℥vj. M.—A tablespoonful every three hours.

Bitartrate of Potassium and Buchu.

38. ℞ Potass. Bitart. ʒiij., Inf. Buchu ℥vj. M.—Two tablespoonfuls thrice daily.

Useful as a diuretic, and where there is very acid urine with an excessive secretion of uric acid.

Oil of Juniper, Nitrous Ether, and Digitalis.

39. ℞ Olei Juniperi ʒss., Spt. Ætheris Nitrosi, Vini Ipecac., Tinct. Digitalis āā ʒiij. M.—Twenty-five drops every three hours.

Diuretic, and in some cases also useful as an emmenagogue.

Nitrate of Potassium and Barley.

40. ℞ Potass. Nit. ʒii., Acid. Nit. dil. ʒi. Misce.

Signa—To be put into one pint of barley water and drunk daily.

Useful in the early stages of fever as a diuretic.

Trousseau's Diuretic Wine.

40*a*.	Scales of Squill	gr. 80
	Dried Digitalis leaves	gr. 140
	Juniper Berries	gr. 720
	Alcohol of 90° strength	℥4
	White Wine (containing 9 to 10 per cent of alcohol)	℥20
	Dry Acetate of Potassium	gr. 224

Divide and crush the Digitalis leaves, Juniper Berries, and the Scales of Squill; macerate them with the White Wine and Alcohol for 15 days in a closed vessel, agitating frequently; strain, press, and filter. Add the Acetate of Potassium, agitate until the salt is dissolved, and filter.

Dose.—One teaspoonful thrice daily, increasing after 2 days to two teaspoonfuls at each dose.

Jalap and Squills.

40*b*. ℞ Tinct. Jalap. ℨi., Acet. Scillæ ℨss., Aq. Menth. Pip. ℥i. M.—The draught thrice daily.

IX.—EMETICS AND EXPECTORANTS

Antimonium Tartaratum et Vinum Ipecacuanhæ.

41. Recipe—Antimonii Tartarati semi-granum, Vini Ipecacuanhæ drachmam, Aquæ ad unciam cum semisse. Misce.

Useful as an emetic.

42. Recipe—Vini Ipecacuanhæ unciam.

A teaspoonful every ten minutes until vomiting is established.

Sulphate of Zinc.

42*a*. ℞ Zinci Sulphatis ℨss., Aquæ ℥iss. M.

A pure emetic.

Tolu, Ammoniacum, and Opium.

43. ℞ Syrupi Tolutani ℥ss., Mist. Ammoniaci ℥ij., Tinct. Camph. Co. ℨiij., Aquæ ad ℥vj. M.—A tablespoonful three times a day.

Useful in chronic bronchitis.

Ammonia, Squill, and Senega.

44. ℞ Ammonii Carbonatis ℨj., Tinct. Scillæ ℨiij., Tinct. Camph. Co. ℥ss., Infus. Senegæ ad ℥vj. M.—A tablespoonful every four hours.

A stimulating expectorant in various chest affections.

Ipecacuanha, Tolu, and Acacia.

45. ℞ Vin. Ipecac. ℨij., Syrup. Tolutani ℨiv., Mucilag. Acaciæ ad ℥ijss. M.—A teaspoonful every hour or every second hour.

Useful in acute bronchitis or measles with chest symptoms, or chest complications in continued fevers.

Lobelia, Spirit of Chloroform, and Conium.

46. ℞ Tinct. Lobeliæ Æther. ʒii., Spt. Chloroform. ʒiij., Tinct. Conii ʒiij., Mist. Amygdalæ ad ℥vj. M.—A tablespoonful three times a day.

Useful in asthma, etc.

Ipecacuanha, Myrrh, and Potassium Nitrate.

46*a*. ℞ Pulv. Ipecac. grs. vi., Pulv. Myrrhæ grs. xii., Potass Nitrat. ʒss. M.—Div. in Pulv. iv. One every four hours.

In chronic bronchitis, asthma, etc.

Ipecacuanha, Squill, and Tolu.

46*b*. ℞ Vini Ipecac., Tinct. Scillæ āā ʒi., Syr. Tolu ʒvi., Mist. Amygdal. ℥v. S.—A tablespoonful when the cough is troublesome.

In asthma, bronchial catarrh, etc.

The following *tabloids* are useful in hoarseness—

Potass Chloras.
,, ,, c. Borax.
,, ,, ,, et Cocaine.

And as an expectorant Tar 1 gr. and Codeina ⅛ gr., or Chloramine Lozenge (Wyeth's), (Tolu, Ammoniacum).

X.—HYPODERMIC REMEDIES

Carbolic Acid—Pure Carbolic Acid, 1 or 2 gr. Water up to 112 m. Dose—8, 16, or 24 m. Trikresol, ⅓ gr. in the same proportion of water, same dose.

Aconitin—Aconitine, 1 to 4 m. (Martindale and Westcott). Tabloids $\frac{1}{260}$ and $\frac{1}{130}$ gr.

Æther—Ether. Dose of Sulphuric Ether, 20 to 40 m.

Alcohol in the form of brandy—Dose, ʒss.-ʒi., causes little pain.

Antitoxin solution for Diphtheria—The amount injected should contain 1500 immunising units.

The injection is made by means of a Pravaz syringe, which has been previously sterilised by a 3 per cent carbolic acid, or 1 per cent solution of Trikresol. For therapeutic treatment, 1500 units are to be injected on the first day of the disease. When the disease has taken root, or on the second, third, or fourth day, the dose may be repeated if necessary.

Arsenium—Arsenic. 1 part of Liq. Arsenicalis to 2 parts of distilled water.

Atropina—Atropine. Prepared tabloids of the neutral sulphate, $\frac{1}{150}$, $\frac{1}{100}$, $\frac{1}{60}$ gr. are useful.

Caffeina—Caffeine. Caffeine and salicylate of sodium (Martindale and Westcott). Dose 1 to 6 m., or tabloids of Caffeine Sodio-salicylate = ½ gr.

Chloroformum—Chloroform. Dose 10 to 20 m.

Cocaina—Cocaine. Tabloids $\frac{1}{6}$, $\frac{1}{4}$, $\frac{1}{2}$ gr.

Codeina—Codeine. Hydrochlorate of codeine, 1 gr.; distilled water up to 128 m. (16 m. $=\frac{1}{8}$ gr.)

Digitalinum—Digitalin. Dose $\frac{1}{100}$ gr. tabloid.

Hydrargyrum—Mercury. Perchloride discs $=\frac{1}{16}$ gr. or tabloids $=\frac{1}{60}$ and $\frac{1}{30}$ gr.

Hyoscina—Hyoscine. Tabloids $\frac{1}{200}$ and $\frac{1}{75}$ gr.

Morphina—Morphine. Morphine may be combined with Cocaine or Atropine. Cocaine Hydrochlor. gr. 3, Morphine Hydrochlor. gr. 1, distilled water up to 224 m.—16 m. $=\frac{1}{14}$ gr. of Morphine and $\frac{1}{5}$ gr. of Cocaine. Atropine Sulphate gr. 2; Morphine Acetate gr. 40; Acetic Acid m. 4. Water up to ℥i.—12m. $=1$ gr. of Morphine and $\frac{1}{20}$ gr. of Atropine.

Phenazonum—Antipyrin. Dose of 2 gr. in distilled water.

Picrotoxinum—Picrotoxin. Dose $\frac{1}{100}$ to $\frac{1}{25}$ gr.

Pilocarpina—Pilocarpine. Nitrate of pilocarpine, 1 gr.; distilled water, 20 m. Dose 2 to 6 m.

Quinina—Quinine. Quinine hydrobromate, 15 gr.; distilled water, 80 m. 16 m. (=3 gr.) thrice daily. Tabloids $\frac{1}{2}$ gr.

Sparteine. Dose $\frac{1}{10}$ to $\frac{1}{4}$ gr.

Strophanthin. Tabloids $=\frac{1}{500}$ gr.

Strychnine. Discs $=\frac{1}{70}$ gr. Tabloids $=\frac{1}{100}$ and $\frac{1}{150}$ gr.

XI.—GARGLES AND INHALATIONS

Gargarisma Acidi Tannici.

47. Recipe—Acidi Tannici grana sexaginta, Aquæ Camphoræ uncias sex. Solve.

Signa—The gargle, to be used frequently.

Myrrh and Alum.

48. ℞ Tinct. Myrrhæ ʒiij., Aluminis ʒj., Infusi Rosæ Acidi ad ℥vj. M. —To be used frequently in mercurial salivation, or scarlatinal or aphthous ulceration of the throat.

Carbolic Acid, Tannin, Capsicum.

48*a*. ℞ Glycerini Acidi Carbolici ʒiii., Acid. Tannici ʒii., Tinct. Capsici ʒi., Infus. Rosæ Acidi ad ℥xii. M.—The gargle to be used frequently.

Recommended in "clergyman's sore throats."

Tannin and Glycerin.

49. ℞ Acid. Tannici ℥ss., Glycerini ℥iv. S.—The throat to be touched with this twice or thrice daily in scarlet fever, etc.

Borax and Carbolic Acid.

49*a*. ℞ Glycerini Acidi Borici ʒiv., Glycerini Acidi Carbolici ʒiii., Aq. Rosæ ad ℥x. M.—The gargle to be used frequently.

Recommended in chronic sore throat.

Borax and Glycerin.

50. ℞ Boracis ʒj., Glycerini ℥ij. S.

Useful in ulceration of mouth and throat.

Nitrate of Potassium.

51. ℞ Potass. Nitrat. ʒj., Aquæ ℥j.—Saturate white blotting-paper in this solution, and dry it; cut the paper into pieces 3 inches long and ½ inch broad. One piece may be lighted and the smoke inhaled. One to six papers may be used in succession for each inhalation.

Recommended as an antispasmodic in asthma.

Hop Inhalation.

52. ℞ Ol. Lupuli ℥ss., Magnesii Carb. Pond. ʒj., Aquæ ad ℥iij. M.—A teaspoonful to be put into a pint of boiling water, and used by Maw's inhaler.

Useful in phthisis, when cough is irritable, and in various chest affections.

Eucalyptus Inhalation.

52*a*. ℞ Ol. Eucalypti, Spt. Chloroformi, āā ℥ss. Forms a good inhalation.

Menthol, Camphor, Oil of Eucalyptus.

52*b*. ℞ Menthol, Camphoræ āā gr. i., Ol. Eucalypt. m. x., Paroleine ad ℥i. Mix well. To be used morning and evening in a special spray producer.

Recommended in nasal catarrh.

Cocaine, Menthol, Vaseline.

52*c*. ℞ Cocain. Hydroch. gr. i., Menthol gr. ii., Vaseline gr. x. M.

Recommended in nasal catarrh.

Creosote Inhalation.

53. ℞ Creosot. ʒiij., Magnes. Carb. Pond. ʒiss., Aquæ ad ℥iij. M.; or,

Carbolic Acid Inhalation.

53*a*. ℞ Acid. Carbolici ℥i., Glycerini ℥i., Aquæ ℥vi. S.—A teaspoonful in a pint of water at 150° F. for each inhalation.

Useful in chronic congestion of the larynx, and in hooping-cough.

Trikresol Inhalation.

53*b*. ℞ Trikresol ʒi., Aquæ ad ℥xx. When boiled continuously a vapour of the same strength is given off. A weaker solution used for children.

Recommended by Dr. R. Lee as better than the carbolic acid inhalation.

Pine Inhalation.

54. ℞ Ol. Pini Sylvestris ʒij., Magnes. Carb. Pond. ʒj., Aquæ ad ℥iij. M.—A teaspoonful in a pint of water at 150° F. for each inhalation.

XII.—POWDERS, LOTIONS, LINIMENTS, ETC.

Amylum, Zinci Oxidum et Camphora.

55. Recipe—Pulveris Amyli, Zinci Oxidi ana uncias duas, Pulveris Camphoræ drachmam. Misce.

May be used in acute eczema, erysipelas, or shingles.

Dilute Hydrocyanic Acid and Perchloride of Mercury.

55*a*. ℞ Acid. Hydrocyanici dil. ʒi., Hydrarg. Perchlor. gr. ii., Mist. Amygdalæ ad ℥vi. M.

For external use. Useful in prurigo and various skin affections attended with itching.

Cajuput, Opium, Turpentine, and Ammonia.

55*b*. ℞ Ol. Cajuputi, Tinct. Opii āā ʒii., Ol. Terebinth ℥iv., Liniment Ammon. ℥i.

This liniment should be applied in chronic rheumatism when a stimulating embrocation is indicated.

Prussic Acid and Potash.

56. ℞ Liquoris Potassæ ʒij., Acid. Hydrocyanici dil. ʒj., Aquæ ad ℥vj. M.

Useful in pityriasis.

Carbolic Acid and Glycerin.

56*a*. ℞ Acidi Carbolici gr. viij., Glycerini ℥ss., Aquæ ad ℥j. S. et M.

Applied to pustules in small-pox.

Bicarbonate of Sodium and Glycerin.

57. ℞ Sodii Bicarb. ʒi., Glycerini ℥iss. Solve. S.—The lotion.

Useful in the itching of cutaneous diseases.

Lead and Glycerin Lotion.

57*a*. ℞ Liq. Plumbi Subacetatis ʒi., Glycerini ʒiii., Aquæ ad ℥vi. M.

Recommended in acute eczema, especially of the face.

Prussic Acid Lotion.

57*b*. ℞ Acid. Hydrocyan. dil. ʒii., Sodii Bicarb. ʒi., Glycerini ℥vi., Aquæ Rosæ ad ℥vi. M.

Used in acute eczema and for the relief of pruritus.

Oxide of Zinc Lotion.

57*c*. ℞ Zinci Oxidi ʒiv., Glycerini ʒi., Liquoris Calcis ℥ii., Aquæ Rosæ ad ℥vi. M.

Of service in acute eczema and Acne rosacea.

Lotion of Potash Soap.

57*d*. ℞ Saponis Mollis, Spt. Rect. āā ℥i., Ol. Rosmarini m. iv., Aquæ ad ℥iv. M.—Rub in well night and morning.
Useful in psoriasis, acne, and chronic eczema with much thickening.

Lotion of Potassa Fusa.

57*e*. ℞ Potass. Fusæ gr. v.-xx., Aquæ ℥i. Solve.—Paint on at night, washing off when smarting becomes severe.
Valuable in the later stages of chronic eczema with much thickening.

Sulphur Lotion.

57*f*. ℞ Sulphuris ʒiii., Glycerini ʒiv., Spt. Rect. ad ℥iv. M. S.—Rub in at night.
Valuable in Acne vulgaris.

Carbolic Acid and Glycerin.

57*g*. ℞ Acid. Carbol. pur. ʒii., Glycerini ℥i. M.
Very useful in ringworm of the head; for a child of ten. About half or one-third this strength for a child of three or four.

Liniments of Belladonna, Chloroform, and Opium.

57*h*. ℞ Linimenti Belladonnæ ℥i., Liniment. Chloroform. ℥i., Liniment. Opii ℥ii. M.
In chronic rheumatism, a teaspoonful placed on flannel and rubbed into the affected part.

57*i*. ℞ Lin. Aconit., Lin. Belladon., Lin. Chloroform. āā ℥i.
Directions as in 57*h*.

Corrosive Sublimate Lotion.

58. ℞ Hydrarg. Perchloridi gr. iv., Spt. Rect. ʒiv., Aquæ ad ℥ii. M.—Rub in night and morning.
Used in tinea of all kinds.

Corrosive Sublimate and Soap.

58*a*. ℞ Hydrarg. Perchlor. gr. viii., Saponis Mollis ℥iss., Spt. Rect. ℥iss. Solve—To be rubbed in night and morning.
Especially useful in Tinea versicolor.

Corrosive Sublimate and Sal-Ammoniac.

58*b*. ℞ Hydrarg. Perchlor. gr. iii., Ammon. Chloridi ʒii., Tr. Benzoini Co. ʒii., Aquæ Rosæ ad ℥viii. M.
An excellent lotion for lentigo and other pigmentary spots.

Hyposulphite of Sodium.

58*c*. ℞ Sodii Hyposulphitis ʒii., Glycerini ʒiv., Aquæ Rosæ ad ℥iv. M.
Useful in all varieties of tinea.

Austro-German "Yellow" and "Black" Washes.

58*d*. Aq. Phagedænica Lutea (yellow wash)—Hydrarg. Mur. Corros. Pulv. 0·1, Aquæ Calcis 30·0.

Aq. Phagedænica Nigra (black wash)—Calomelanos 2·0, Pulv. Opii 2·5, Aq. Calcis 100·0.

Washes employed in syphilitic ulcers.

XIII.—OINTMENTS

Plumbum et Vaselinum.

59. Recipe—Emplastri Plumbi, Vaselini, ana uncias duas.

Misce—Apply on strips of lint twice a day.

Most valuable in subacute eczema, especially of the limbs.

A modification of Hebra's Ungt. Diachyli.

Oxide of Zinc and Camphor.

59*a*. ℞ Spt. Camph. ʒi., Glycerini ʒii., Ungt. Zinci ℥i. M.

Useful in eczema, especially in children.

Oil of Cade.

60. ℞ Ol, Cadini, Spt. Rect., Sapon. Mollis āā ℥i., Spt. Lavand. ʒiiss. M.

Recommended by Dr. M‘Call Anderson in chronic eczema.

Oil of Cade and Glycerin of Starch.

60*a*. ℞ Ol. Cadini ʒii., Glycerini Amyli ad ℥i. M.

A mild stimulant. Used in chronic eczema.

Sulphur and Potash.

60*b*. ℞ Sulphuris Sublim. ʒii., Potass. Carb. ʒi., Adipis ℥i.

Used in scabies. To be rubbed in firmly over whole surface, except face and head, for three nights in succession after hot bath.

Storax.

60*c*. ℞ Styracis Præparat. ʒii., Adipis ℥i. M.

Used for scabies in patients with a delicate skin.

Bismuth, Zinc, and Prussic Acid.

61. ℞ Bismuthi Subnitrat. ʒj., Ungt. Zinc. ℥j., Acid Hydrocyanici dil. ʒj. M.

Useful in various skin affections.

62. ℞ Balsami Peruviani ʒij., Olei Rosmarini m. xx., Tinct. Cantharid. ʒj., Olei Ricini ℥ss., Adipis Præp. ℥iss. M.

To be rubbed in night and morning to roots of hair in cases of baldness, after syphilis, fevers, etc.

Aconitine and Iodine.

63. ℞ Aconitinæ gr. ij., Ungt. Iodi ʒj. M.—A little to be painted over part in severe neuralgia (tic-douloureux).

Citrine Ointment.

64. ℞ Ungt. Hydrarg. Nit. ʒi., Adipis ad ℥i. M.
Used in vesicular, squamous, and some parasitic affections.

White Precipitate.

64*a*. ℞ Hydrarg. Ammoniat. gr. xii., Vaselini ℥i. M.—Rub in at night.
A mild parasiticide and a stimulant in chronic eczema.

Tar and Mercury.

64*b*. ℞ Ungt. Hydrarg. Nitratis ʒiss., Picis Liquidæ vel Ol. Cadini ʒii., Adipis Benzoat. ad ℥i.
Used in chronic eczema and for pruriginous eruptions.

Ichthyol and Lard.

64*c*. ℞ Ichthyol ʒii., Adipis ℥i. M.—To be smeared over the parts two or three times daily.
Useful in chronic eczema, some cases of acne, also in chilblains.

Iodide of Sulphur Ointment.

65. ℞ Sulph. Iodid. gr. x., Sulph. Sublim. gr. x., Acid. Hydrocyan. dil. m. x., Adipis ℥i. M.
Used in acne and other skin affections.

Chrysophanic Acid Ointment.

65*a*. ℞ Acidi Chrysophanici ʒi., Lanolin ℥i. Mix at a temperature of 90° in a water bath. About the size of a bean to be rubbed into each patch of psoriasis daily.

Compound Citrine Ointment.

(Dr. Alder Smith's.)

65*b*. ℞ Acid. Carbol. Pur., Ungt. Hydrarg. Nitratis, Ungt. Sulphuris āā ℥i. M.—Rub in every night.
Most valuable in ringworm of the head; for children under ten double or treble the amount of sulphur ointment.

Oleate of Mercury.

65*c*. ℞ Hydrarg. Oleat. (5%) ʒvii., Ætheris Acet. ʒi. M.—Rub in night and morning.
Very serviceable in ringworm of the head.

Cod-Liver Oil and Hypophosphite of Lime.

65*d*. An emulsion may be made by taking Hypophosphite of Lime 120 gr., Citric Acid 90 gr., Price's No. 1 Glycerine 2 ounces, Gum Acacia in fine powder 3 ounces, Gum Tragacanth in fine powder 1¼ ounces, Refined Sugar 3 ounces, Water 10 ounces, and Cod-Liver Oil 20 ounces. The emulsion can be flavoured by oils of bitter almonds, cloves, lemons, or cinnamon. Dose—A teaspoonful mixed with water or milk, gradually increased to a tablespoonful, immediately after food. The emulsion of Thomson of Elgin is a good one.

Depilatory.

65*e*. ℞ Sodii Sulphitis ʒiii., Calcis ʒx., Amyli ʒx. M.—Mix with water to make a paste; apply to the skin for two minutes, then scrape off.

65*f*. ℞ Barii Sulphuret. ʒiss., Zinci Oxid. ʒvi., Carmin. gr. i. M.—Applied as in directions under 65*a*.

Creosote Ointment.

65*g*. ℞ Creosoti ʒi., Ung. Cetacei ℥i. M.—In prurigo.

Zinc Gelatin Ointment.

65*h*. ℞ Zinc. Oxid. Gelatin āā 25, Glycerin 25, Water 45. M.—In eczema.

XIV.—SALINES

Spiritus Ammoniæ Aromaticus, Liquor Ammonii Citratis, Syrupus Limonis.

66. Recipe—Spiritus Ammoniæ Aromatici drachmas tres, Liquoris Ammonii Citratis uncias quatuor, Syrupi Limonis unciam, Aquæ ad uncias octo. Misce.

Signa—A tablespoonful every three or four hours.

Useful in early stages of tonsillitis, diphtheria, or in febricula.

Chlorate of Potassium (Fever-Drink).

67. ℞ Potass. Chlorat. ʒj., Aquæ Oj. S.

Recommended as a daily drink in scarlet or other fever.

Colchicum and Magnesia.

68. ℞ Tinct. Colchici ʒiss., Magnes. Carb. Pond. vel Levis ʒij., Aquæ ad ℥vj. M. S.—A tablespoonful every three hours.

Useful in gout.

68*a*. ℞ Vini Colchici ʒss., Magnes. Carb. gr. xv., Magnes. Sulphat. ʒj., Aquæ Cinnamom. ad ℥ij. M.

This draught is recommended by Sir Charles Scudamore during the paroxysm of gout.

Dr. Mortimer Granville's Prescription for Gout.

68*b*. ℞ Ammonii Chloridi ʒiv., Potassii Chloratis ʒii., Tincturæ Iodi ʒii., Glycerini ℥iss., Aquæ ad ℥xii. S. et M.

S.—Two tablespoonfuls every four hours in water.

XV.—SEDATIVES

Potassii Bromidum et Chloral Hydras.

69. Recipe—Potassii Bromidi drachmas tres, Chloral Hydratis drachmas duas, Aquæ uncias sex. Misce.

Signa—A tablespoonful every two hours to an adult. To a child a teaspoonful.

Useful in the convulsions of children or in laryngismus stridulus. Also in delirium tremens and in fevers, when there is great restlessness.

Bromoform and Glycerin.

69*a*. ℞ Bromoformi m. xvi., Sp. Rect. ʒii., Glycerini ʒxii., Tinct. Card. Co. ʒii. Mix in order and give a teaspoonful every six hours.

Recommended in hooping-cough.

Opium and Antimony.

70. ℞ Tinct. Opii ʒii., Antimonii Tartar gr. iv., Aquæ Camph. ad ℥vi. M.—A tablespoonful every two hours until sleep is produced.

Useful in delirium tremens.

Phenazonum.

70*a*. ℞ Phenazoni gr. 12. Divide into six powders. One to be taken every four to six hours.

Useful in hooping-cough, decreases the severity of each paroxysm.

Morphine and Hydrocyanic Acid.

71. ℞ Morphinæ Hydrochlor. gr. i., Acid. Hydrochlor. dil. m. v., Acid. Hydrocyanic. dil. ʒss., Syrup. Scillæ ℥j., Aquæ ℥i. M.—One teaspoonful to be taken when cough is very severe, as in advanced cases of phthisis.

Bromide of Potassium and Ergot.

71*a*. ℞ Potass. Bromid. ʒiij., Extract. Ergotæ Liquid. ʒij., Aquæ ad ℥vj. M.—A tablespoonful three times a day.

Useful in cerebral congestion, and also in infantile spinal paralysis in early stage.

Brown-Séquard's Mixture of Bromide of Potassium, for Epilepsy.

71*b*. Recipe—Potassii Iodidi drachmas duas, Potassii Bromidi unciam, Ammonii Bromidi drachmas tres, Potassii Bicarbonatis drachmam, Tincturæ Calumbæ unciam, Aquæ Destillatæ ad uncias sex. Misce.

S.—To adults four doses a day, three of one teaspoonful each before meals, and the fourth of three teaspoonfuls at bedtime with as much water as desired.

71*c*. Pulv. Doveri. The German Pharmacopœia Dover's powder is thus prepared—0·08 of Pulv. Opii, 0·08 of Pulv. Ipecac., and 0·6 of Sugar.

Hydrocyanic Acid.

71*d*. ℞ Acid. Hydrocyan. dil. ♏4, Tinct. Calumb. ʒi., Aquæ ʒxi. M. S.—The draught in irritable dyspepsia.

XVI.—STIMULANTS

Spiritus Chloroformi et Mistura Spiritûs Vini Gallici.

72. Recipe—Spiritûs Chloroformi drachmas duas, Misturæ Spiritûs Vini Gallici ad uncias sex. Misce.

Signa—A tablespoonful every two hours in the low stages of fevers or other exhausting diseases.

An agreeable restorative.

Codeinæ Syrupus.

72*a*. ℞ Codeinæ gr. 20, Sp. Vin. Ten. ℥i.¼, Aq. Destill. ℥i.¼. Dissolve and add Syrup to ℥xx. M. Dose—½-2 drachms, or ℞ Codeinæ (Merck) 1, Alcohol 25, Syrupi 476. M.—1 tablespoonful equal about ½ a grain of Codeine.

In diabetes and chronic bronchitis.

Ammonia, Potash, and Rhubarb.

73. ℞ Spt. Ammon. Aromat., Liquor. Potass., Tinct. Rhei āā ℥j. M. S.—A teaspoonful twice a day in water, as an antacid stimulant and stomachic.

Morphine, Acetate of Ammonium, Ipecacuanha, or Antimony.

73*a*. ℞ Liq. Morph. Hydroch. ʒi., Liq. Ammon. Acet. dil. ℥ii., Vin. Ipecac. ʒiii., vel Vin. Antimon. m. 60, Aq. Camphoræ ad ℥viii. M.—A tablespoonful every four hours.

Recommended in lobar pneumonia.

Soda and Calumba.

74. ℞ Sodii Bicarb. ʒj., Tinct. Calumb. ʒvj., Aquæ Anethi ad ℥vj. M. —A tablespoonful every three hours.

Useful to relieve heartburn and nausea.

XVII.—TONICS

Quininæ Sulphatis Mistura.

75. Recipe—Quininæ Sulphatis grana sexaginta, Acidi Sulphurici diluti drachmam cum semisse, Syrupi Aurantii, Tincturæ Aurantii ana drachmas quatuor, Aquæ ad uncias sex. Misce.

Signa—A dessertspoonful three times a day.

Iron, Chlorate of Potassium, and Glycerin.

76. ℞ Tinct. Ferri Perchlor. ʒii., Potass. Chlor. gr. 40, Glycerini ℥i., Aq. ad ℥vi. M.—A teaspoonful every ten, fifteen, or twenty minutes.

Recommended in diphtheria.

Quinine and Gentian.

77. ℞ Ferri et Quininæ Citratis, Ext. Gentian āā ʒss. M.—To be divided into eighteen pills. One to be taken twice a day.

Iron, Hydrochloric Acid, and Calumba.

78. ℞ Tinct. Ferri Perchlor. ʒiss., Quin. Sulph. gr. lx., Acid. Hydrochlor. dil. ʒj., Tinct. Quassiæ ʒvj., Inf. Calumb. ad ℥vj. M. S.—A tablespoonful three times a day.

Iron, Calumba, and Glycerin.

79. ℞ Tinct. Ferri Perchlor. ʒij., Tinct. Calumbæ ʒiij., Glycerini ℥ij. Aquæ ad ℥vj. M. S.—A tablespoonful three times a day.

Useful in anæmia, and sometimes also in phthisis.

Nitro-Muriatic Acid and Gentian.

79*a*. ℞ Acid. Nitro-Mur. dil. ʒii., Tinct. Gentian. Co. ʒiiiss., Ext. Tarax. Liquid. ad ℥iii. M. S.—A dessertspoonful thrice daily.

Strychnine and Nitric Acid.

80. ℞ Liquor. Strychninæ Hydrochlor. ʒj., Acid. Nitric. dil. ʒiss., Acid. Hydrochlor. dil. ʒiss., Tinct. Zingib. ʒiijss., Syrup. Croci ʒiij., Aquæ ad ℥vj. M. S.—A tablespoonful three times a day.

Useful in some spinal affections.

80*a*. ℞ Strychninæ Sulphatis gr. ⅓, Acidi Phosphor. dil. ʒvi., Syr. Aurantii ℥iss., Aquæ ad ℥vi. M. S.—A dessertspoonful thrice daily in spinal irritation (Hammond).

Syrup of Iodide of Iron and Cod-Liver Oil.

81. ℞ Syrupi Ferri Iodidi ʒiij., Mucilag. Acaciæ ℥j., Ol. Morrhuæ ad ℥vi. M.—A tablespoonful three times a day.

Elixir Guaiacol.

81*a*. ℞ Guaiacol m. xvi., Ol. Gaultheriæ m. vi., Ol. Amygdal. Amar. m. vi., Elixir Saccharini ʒi., Glycerini ʒvi., Sp. Vini Rect. ad ℥ii. M. Liq. Rosæ dulc. q.s. ft. color. ʒi. = 1 minim Guaiacol.

Hypophosphite of Lime and Glycerin.

82. ℞ Calcii Hypophosphitis ʒi., Glycerini ℥ii., Aquæ ℥iv. S.—A tablespoonful three times a day.

Hypophosphite of Lime and Syrup.

82*a*. ℞ Calcii Hypophosphitis ʒi., Syrupi ℥vi. M. S.—A tablespoonful thrice daily.

Iron and Gentian.

83. ℞ Ferri Sulphatis Exsicc., Ext. Gentian. āā ʒss. M.—Divide into twelve pills; one twice daily.

Citric Acid, Citrate of Iron, Bismuth, and Prussic Acid.

84. ℞ Ferri et Am. Citratis ʒiss., Acid. Citrici ʒvj., Aquæ ℥vj. Misce.
℞ Acid. Hydrocyanici dil. m. lxxij., Potass. Bicarb. ʒvj., Liq. Bismuth., Syrup Aurantii āā ℥iij. M.—A dessertspoonful of the contents of each, in a glass of water, thrice daily.

Recommended in dropsy from granular kidney.

Strychnine, Phosphorus, and Quinine.

85. ℞ Strychninæ gr. i., Ferri Pyrophosphatis, Quininæ Sulph. āā ʒi.; Acid. Phosph. dil., Syrup Zingiber āā ℥ij. M. S.—A teaspoonful three times a day in a little water.

Recommended in some nervous affections when strychnine is required.

Phosphorus.

86. ℞ Olei Phosphorat. ʒss., Mucilag. Acaciæ ℥j., Olei Bergamot. gtt. xl. M.—Twenty drops three times a day.

Useful in nervous affections requiring phosphorus.

Nux Vomica and Capsicum.

86*a*. ℞ Tinct. Nucis Vomicæ ʒii., Sp. Chloroformi ʒiii., Tinct. Capsici ʒiss., Aq. ad ℥vi. M.—A tablespoonful thrice daily before food.

Recommended in chronic alcoholism.

Salicylate of Sodium Mixture.

87. ℞ Sodii Salicyl. ʒij., Potass. Acetat. ʒiss., Aquæ ad ℥vj. S.—A tablespoonful every three hours.

Recommended in rheumatic fever.

Phosphorus and Cod-Liver Oil.

87*a*. ℞ Olei Phosphorati (B.P.) m. xl., Ol. Morrhuæ ad ℥vi. M.—A tablespoonful for a child one year old to be given after food.[1]

Recommended in rickets by Whitla.

Hazard's Solution of Phosphorus.

87*b*. ℞ Phosphor. gr. i., Alcohol Ethyl m. 350, Glycerini ʒii., Sp. Menth. Pip. m. x. M.—5 m. may be given to a child three years old.

Recommended in rickets.

Digitalis and Iron.

88. ℞ Tincturæ Ferri Perchloridi ʒii., Tincturæ Digitalis ʒii., Aquæ ℥vss. M.—A tablespoonful twice or thrice daily.

Pil. Ferri (Blaud's Pills modified).

89. ℞ Ferri Sulph. gr. xxx., Potass. Carb. gr. xxx., Pulv. Tragacanth. gr. iii., Aq. q.s. Misce. Divide into eighteen pills.

S.—One thrice daily at first, and increased by one pill every day. Ultimately five pills thrice daily may be taken.

In chlorosis and anæmia of girls previous to puberty.

Citrate of Iron and Ammonium, with Calumba.

90. ℞ Ferri et Ammon. Citrat. ʒi., Tinct. Calumbæ ʒiii., Aquæ Camph. ad ℥vi. M. S.—A tablespoonful thrice daily.

Useful tonic in kidney disease, etc.

Iron, Dilute Phosphoric Acid, Spirit of Lemon.

90*a*. ℞ Tinct. Ferri Perchlor. ʒiv., Acid. Phosphor. dil. ʒvi., Spiritus Limon. ʒii., Syrupi ad ℥vi. M.

S.—A dessertspoonful in water thrice daily after meals.

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[1] See Appendix, p. 597, as to mode of combining.

Rhubarb and Pepsin.

91. ℞ Pulv. Rhei gr. iv., Pepsinæ gr. iij. M.
Useful in dyspepsia with flatulence. To be taken after meals.

Solution of Chlorine and Quinine.

91*a*. Dr. Burney Yeo recommends the solution of chlorine to be made in the following manner. Into a ℥xii. bottle put 15 grains of powdered Potassic Chlorate and pour on it 60 m. of strong HCl. Chlorine gas is at once liberated. Fit a cork into the mouth of the bottle and keep it closed until it becomes filled with the greenish-yellow gas. Then pour water into the bottle, little by little, closing the bottle and well shaking at each addition, until the bottle is filled. Add to this 24 to 36 grains of Quinine and an ounce of syrup of orange peel. Dose—℥i. every two, three, or four hours = 12 to 36 grains of Quinine in the twenty-four hours.

Recommended in typhoid fever.

Chlorate of Potassium, Iron, and Glycerin.

91*b*. ℞ Potass. Chlorat. ʒi., Tinct. Ferri Perchlor. ʒi., Glycerini ʒii., Aquæ ad ℥vi. M.—Two tablespoonfuls every two hours in scarlet fever or suppurative tonsillitis.

Oxide of Zinc Pills.

91*c*. ℞ Zinci Oxidi gr. xxiv., Confectionis Rosæ q.s. M.—Divide into xx. pills ; one to be taken three times a day after meals.

In spinal irritation, ½ gr. of Ext. Nucis Vomicæ may be added to each pill.

Test for Diabetic Urine.

Fehling's Standard Solution is prepared according to the following prescription :—Sulphate of Copper, 90½ grains ; Neutral Tartrate of Potash, 364 grains ; Solution of Caustic Soda, sp. gr. 1·12, four fluid ounces ; add water to make up exactly six fluid ounces. 200 grains of this solution are exactly decomposed by *one* grain of sugar.

The Ureameter.

To estimate the quantity of urea, the following apparatus is useful. The principle of the process depends on the evolution of nitrogen gas which ensues when urine comes in contact with hypobromite of sodium. The first step is to make a solution of caustic soda, which is done by taking of Caustic Soda 1 oz., Water 2½ oz. Measure of this solution, as per mark on bottle, minims 420 ; add 40 minims of bromine. Shake well and allow the mixture to cool thoroughly. We have now a solution of Hypobromite of Sodium.

Next, take off the urine to be tested, as per pipette, 65 minims, which place in a small tube. Insert this into the bottle containing the hypobromite of sodium solution. Cork. Fill up the large tube ⅔ full water, urea, etc.

Next, allow the urine and hypobromite of sodium to mix. The result is the evolution of nitrogen gas. When the decomposition is completed, the graduated index, after deducting the first from the last reading, will reveal the volume of nitrogen gas.

The late Dr. Dittmar, Professor of Chemistry, Technical College, Glasgow, has so constructed the index that each degree of it corresponds at ordinary temperature and pressure to one grain of urea per ounce in the urine. It is thus only necessary to measure the whole quantity of urine passed in the twenty-four hours, and then multiply that by what the index shows, after the evolution of nitrogen gas, to tell the quantity of urea excreted daily.

Thus, supposing the quantity of urine passed in twenty-four hours to be 50 ounces, and the number of grains per ounce of urine as read off to be 8, the total quantity of urea will be 50 × 8 = 400 grains.

The apparatus can be obtained from Mr. Hume, Lothian Street, Edinburgh.

The formula given by Mayer for detecting Quinine in the urine is—Water, 10; Corrosive Sublimate, 12·54; Iodide of Potassium, 49. A cubic centimètre of this solution precipitates a centigramme of Quinine, and the precipitate does not disappear; it is insoluble.

DETECTION OF PEPTONE

"If we test for albumen by the nitric acid and heat test, or by acetic acid and ferrocyanide of potassium, and obtain negative results, we proceed by Hoffmeister's test for peptone. The urine is treated with neutral acetate of lead and filtered. The clear filtrate[1] is acidulated with hydrochloric acid, and phospho-tungstic acid is added until a precipitate ceases to form with it. The fluid is then filtered without delay. The precipitate consists of peptone combined with phospho-tungstic acid and various other substances (animal alkaloids, etc.) It is now washed on the filter with 5 parts of concentrated sulphuric acid in 100 of water, until the fluid which passes through is colourless. In this way the salts are got rid of. The precipitate, while still wet, is washed from the filter with as little water as possible, and is received into a watch-glass. Carbonate of Barium is added until the mixture is alkaline, and the latter is then placed on a water-bath at boiling-point and heated for ten or fifteen minutes, and the Biuret test is applied.

"Peptone is shown by the formation of a colour varying from bluish-red to violet, and varying in intensity according to the quantity present. If this be only a trace the resulting colour is of a dirty red or dull violet."
—Jaksch.

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[1] This should amount to not less than 500 to 600 cc. in volume.

METHODS OF PREPARING BEEF-TEA, MEAT JELLY, ETC.

Beef-Tea.

1. 1 or 2 lbs. lean beef cut up into small squares ; let it soak in enough cold water to cover it well, for three or four hours, with a pinch of salt.

Then boil it quickly for twenty minutes, and strain away the meat.

2. 1 lb. lean beef fresh killed ; mince *very* fine *on a plate*, and put in one pint water.

Let it stand *one hour*.

Set it near the fire to warm gradually *one hour*, then let it boil only *two or three minutes*, and stand it to cool *one hour*, when the fluid is to be poured off.

3. 1½ lb. beef cut into small bits, sprinkle salt on the beef, 1 quart water boiling, gently simmer (*not boil*) one hour, and run it through a cloth. To the same beef add one quart water, simmer two hours, strain it on to four tablespoonfuls of sago ; boil till clear as jelly, then add by degrees to the first straining.

Meat Jelly.

1¼ lb. lean beef.
¼ lb. lean veal.
A good pinch of salt.

Cut up into small pieces, add salt, put into a white jar with *no* water. Place the jar, loosely covered by saucer, into a saucepan half full of water, and let it simmer for eight to ten hours. Strain through a damask napkin ; replace the strained liquor into the jar, and the jar into the saucepan ; simmer one hour longer ; strain again and set to cool.

P.S.—If this does not jelly in a few hours a little of the best gelatine may be added.

Chicken Panada.

Boil a chicken till three parts ready, take off the skin, cut the white meat off when cold, and pound it, in a mortar, to a paste with a little good white stock. Boil gently a few minutes. It should be as thick as custard when done.

METHOD OF PERFORMING POST-MORTEM EXAMINATIONS[1]

Before opening the body the external appearances are to be observed—the presence of injuries or marks of any sort, the state of the post-mortem rigidity, and the cadaveric lividity, as well as the degree of coldness of the body, are to be carefully noted.

Head.—It is better to begin by opening the head, for the condition of the blood-vessels in the meninges can thus be more accurately examined than if, the chest having been opened, the blood is permitted to flow out at the cut ends of the large veins. To open the head, make an incision across the vertex from ear to ear, quite down to the skull. In making this incision the most ready means of parting the hair is to cut the skin from one ear to the other, from within outwards with the back of the knife to the skull; and this preliminary cut having been made, it can be deepened by a second sweep of the knife. With the chisel, the scalp, including the periosteum, is now pushed forwards over the brow, and backwards over the occiput, giving room for the saw to pass round the skull in a horizontal plane about ¾ inch above the orbit and ½ inch above the occipital protuberance. The saw-cut should not go quite through the two tables; the inner one is to be cracked in the line of the saw-cut with the chisel and mallet, the former of which may then be used to prise the skull-cap off. In cases of injury to the head, it is better to carry the saw-cut quite through both tables all round, and then cut the brain clear through at that level with a long knife.

Split up the longitudinal sinus with fine scissors, and with a probe-pointed bistoury divide the dura mater all round along the edge of the skull and cut its attachment to the crista galli. Then pull the dura mater backwards, exposing the surface of the arachnoid. Now remove the brain from before backwards, taking care not to tear any part of it, and divide the spinal cord as low down as possible. Examine the base of the brain, remove the dura mater from the base of the skull, and examine the bone, opening the internal ear if necessary with the chisel.

The examination of the interior of the brain itself is begun by opening the lateral ventricles by two longitudinal incisions along the corpus callosum; after which the knife is laid parallel to the corpus callosum, and the brain is sliced laterally in such a way that each cut stops just short of the convex surface of the hemisphere. The third, fifth, and fourth ventricles may now be opened; and finally a series of closely-placed transverse incisions may be made across the corpora striata and optic thalami to expose their texture in every part. The medulla oblongata is split longitudinally, and a cut through each half of the cerebellum may be made.

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[1] This "method" was written by the late Dr. Foulis, Pathologist to the Glasgow Royal Infirmary.

Trunk.—With a strong knife an incision is made down the middle line of the trunk from the supra-sternal notch to the pubes, opening the abdominal cavity. The soft parts are held back from the lower edge of the thorax, and an incision carried through the peritoneum along the lower costal cartilages, after which the dissection of the flesh from the front of the thorax can be done with long sweeping cuts. The costal cartilages are then cut half an inch from the anterior ends of the ribs, beginning with the second cartilage, and thence passing downwards to the lower margin of the thorax, the cut inclining outwards as it descends. In cutting these cartilages hold the knife with the handle level, so that as each cartilage is cut the edge of the knife may fall on the next cartilage and not plunge into the lung; but, in cutting the first costal cartilage, which must next be done, the knife is to be held perpendicularly with the edge towards the clavicle, and directed rather outwards to avoid the manubrium sterni. Then cut the sterno-clavicular and costo-clavicular ligaments by an incision curved from above downwards and outwards, and remove the sternum. Note the position of the heart, etc., and the state of the pleuræ and peritoneum, and open the pericardium, pinching up a part of it and cutting it horizontally. Having observed its contents, open the heart. This may be done *in situ* by two incisions along the anterior and posterior borders into the ventricles; or the heart may be removed, and afterwards opened by the incisions just mentioned, followed by a cut along each side of the septum ventriculorum from the apex into the pulmonary artery and aorta. The state of the valves, of the heart tissue, and of the ascending arch of the aorta can then be studied. The lungs may now be removed and divided by one long cut from apex to base. The bronchi are split up with scissors, and the trachea and larynx similarly split up with the knife. If desired, the great median incision first described may be continued up to the chin, and the tongue, fauces, larynx, and upper half of the gullet can be removed bodily and examined in detail afterwards.

Now divide the diaphragm so as to let the liver fall back into the chest, open the stomach (if this has not already been done), and clean out its contents. Then examine the spleen, kidneys, ureters, bladder, and urethra, not forgetting the supra-renal capsules. The state of the gall-bladder and its duct must now be ascertained. For this purpose carry the incision in the stomach along the duodenum, past the orifice of the ductus communis, wipe the surface of the mucous membrane, and putting gentle pressure on the gall-bladder, note whether the bile flows freely from the duct. Then examine the portal vein and remove the liver, which may be divided by long transverse incisions. To examine the bowels, remove them from the body, separating them with the knife along the edge of the mesentery as close as possible to the gut. Split the gut from end to end with the gut scissors, and examine the mucous surface under a stream of water.

The mesenteric glands, aorta, and pancreas may next be looked at, and then the front of the spine should be cleared of all soft tissue. Any lateral curvature or exostosis will thus come into view, and the spinal canal can then more readily be opened. This may be done from before or behind. If from before, the bodies of the vertebræ are to be separated by saw or chisel ; if from behind, the cadaver must be laid prone, a longitudinal incision made from the occiput to the sacrum, and the soft tissues removed from the spinal arches, which are then to be cut with the saw and forceps.

WEIGHT OF ADULT ORGANS

		Male.	Female.
Brain		49 oz.	44 oz.
Heart		10 oz.	9 oz.
Lungs	right	24 oz.	17 oz.
	left	21 oz.	15 oz.
Liver		53 oz.	45 oz.
Spleen		4 to 10 oz.	4 to 10 oz.
Kidney		4½ oz.	4 oz.

GLOSSARY

Acarus Scabiei.—From ἀ neg., κείρω to cut, and *scabere* to scratch.—The acarus, whose presence gives rise to scabies, a contagious disease of the skin attended with great itching.

Acne.—From ἀκμή strength.—An eruption of hard, distinct, and inflamed tubercles appearing on the forehead, temples, etc.

Ægophony.—From αἴξ a goat, and φωνή voice.—A sound similar to the bleating of a goat. Heard through the stethoscope, when applied to the inferior angle of the scapula, in cases of pleurisy with effusion.

Alopecia areata.—From ἀλώπηξ a fox (a common affection of this animal), and *area* an open space.—Loss of hair, leaving little circular or oval bald patches.

Alteratives.—From *altero* to vary.—Medicines which promote a salutary effect on the functions of the system without causing apparent evacuations.

Amenorrhœa.—From ἀ neg., μήν a month, ῥέω to flow.—A suppression of the monthly discharge.

Amphoric.—From ἀμφορεύς a Greek wine-vessel.—In auscultation, a sound similar to that produced by blowing into a decanter a little distance from the aperture.

Amyloid.—From ἀ neg., μύλη a mill, *i.e.* not ground in a mill.—Resembling starch. If iodine be applied to an amyloid organ, the affected portions change to a brown colour, but, on the subsequent application of sulphuric acid, a bluish tint is produced.

Anæsthesia.—From ἀ neg., αἰσθάνομαι to feel.—Loss of sensation.

Anasarca.—From ἀνά through, σάρξ flesh.—A collection of serum in the integuments of the body, characterised by pitting on the application of pressure.

Aneurysm.—From ἀνευρύνω to make wide.—A swelling produced by the dilatation of an artery.

Angina Pectoris.—From ἄγχω to strangle, and *pectus* the breast.—A dangerous paroxysmal affection, characterised by a sense of suffocation, severe pain in the chest, and great anxiety.

Anthelmintics.—From ἀντί against, ἕλμινς a worm.—Medicines which expel worms from the intestines.

Antipyretics.—From ἀντί against, πυρετός fever.—Remedies used for allaying fever.

Aphasia.—From ἀ neg., φάσις speech.—A partial or complete loss of the power of speech, due to cerebral causes.

Aphonia.—From ἀ neg., φωνή voice.—Loss of voice.

Aphtha.—From ἅπτω to fix upon.—Thrush. Small round white vesicles affecting lips, mouth, and intestinal canal.

Apoplexy.—From ἀπό of the cause, πλήσσω to strike.—Loss of sensation and voluntary motion, whilst the respiration and heart's action are slightly, or not at all, affected.

Appendicitis.—Inflammation of the appendix vermiformis from various causes. Under this title are now included diseases formerly considered distinct—typhlitis and perityphlitis.

Arcus senilis.—From *arcus* anything arched or curved, and *senilis* aged.—An opaque ring round the margin of the cornea, observed in old people.

Ascarides.—From ἀσκαρίζω I leap.—A genus of intestinal worms.

Ascites.—From ἀσκός a leather sack or wine-skin.—A collection of serous fluid within the peritoneum.

Asthma.—From ἀσθμάζω to gasp for breath.—A sensation of suffocation, or constriction of the chest with cough and expectoration.

Atrophy.—From ἀ neg., τρέφω to nourish.—Progressive wasting of the whole or a portion of the body, caused by decrease in size or number of its histological elements.

Bacteriology.—From βακτήριον a rod.—A term applied to the study of micro-organisms.

Bothriocephalus latus.—From βοθρίον a small pit, κεφαλή a head. —The broad tapeworm.

Bronchiectasis.—From βρόγχος the windpipe, ἔκτασις a stretching out.—Dilatation of the bronchi.

Bronchocele.—From βρόγχος the windpipe, κήλη swelling.—An inaccurate term for an enlargement of the thyroid gland.

Bronchophony.—From βρόγχος the windpipe, φωνή voice.—A distinct, but not loud, sound of the voice heard when the stethoscope is applied to the chest in cases of pneumonia, phthisis, and other consolidations.

Bruit de pot fêlé.—Sound of a cracked vessel, heard sometimes on percussing over a cavity in the lung, when it is near the surface and communicates with an open bronchus.

Cachexia.—From κακός evil, ἕξις habit.—A depraved condition of the body, which is usually the result, and not the cause, of disease.

Cardialgia.—From καρδία the heart, ἄλγος pain.—A burning pain referred to the stomach. Heartburn.

Caseation.—From *caseus*, cheese.—A pathological process observed in tuberculosis, when the inflammatory product becomes yellow, friable, and dry.

Catamenia.—From κατά answering to, μήν a month.—The menstrual discharge of females.

Catarrh.—From καταρρέω to flow down.—Inflammation of, and discharge of fluid from, a mucous membrane. Generally used to denote a common cold affecting the nose (Coryza), the frontal sinuses (Gravedo), and trachea and bronchial tubes (Bronchitis).

Cathartics.—From καθαίρω to purge.—Medicines which increase the number of intestinal evacuations.

Cavernous Respiration.—From *caverna* a cave, grotto.—A hollow sound heard during auscultation, in dilated bronchi and diseases causing excavation in the lung tissue. Tracheal respiration.

Chloasma.—From χλοάζω to be of a pale light green.—An eruption of light yellowish-brown patches on the chest and abdomen. Dark circles round the eyes.

Chlorosis.—From χλωρός green—generally pale, pallid.—Green sickness. Peculiar to young girls suffering from disordered or arrested menstrual flow. There is frequently a green tint of the complexion.

Chorea.—From χορεία a dancing.—A disease attended with erratic movements, grimaces, twitchings, and gesticulations of an involuntary character.

Cirrhosis.—From κιρρός yellow.—An increase of connective tissue in the liver or kidneys, which may be so excessive as to absorb or destroy the natural structure by pressure. In cirrhosis of the liver, the pale colour is due to the large amount of yellow pigment in the secreting cells; the liver is also smaller and puckered, producing the hobnailed condition.

Clonic.—From κλόνος any violent motion, tumult.—A term applied to convulsive movements in which contractions and relaxations alternate.

Condylomata, pl. of Condyloma.—From κόνδυλος a knuckle.—Indolent, wart-like protuberances about the genital organs and anus.

Corymbose.—From κόρυμβος a cluster of fruit or flowers terminating in a flat plane.

Coryza.—From κάρα the head, and ζέω to boil.—A mucous, ropy discharge from the nostrils, caused by inflammation of the Schneiderian membrane.

Crepitation.—From *crepito* to crackle.—A sound heard in the first stage of pneumonia, prior to consolidation, and in the third stage (resolution). It is also manifest in acute capillary bronchitis.

Cutis anserina.—*Cutis* skin, *anser* a goose.—A condition of the skin observed in the early stage of fever, and in various nervous affections, and resembling the skin of a plucked goose.

Cyanosis.—From κύανος blue.—Lividity or duskiness of the face. Observed in affections interfering with the entrance of air into the lungs.

Cynanche parotidea.—From κύων a dog, ἄγχω to choke; παρά belonging to, οὖς the ear.—Mumps. Inflammation of the parotid gland.

Cysticercus.—From κύστις the bladder, κέρκος a tail.—A genus of the Entozoa of the family of the hydatids. The tailed bladder-worm.

Desquamation.—From *desquamo* to scale off.—Separation of the epidermis in the form of scales.

Diabetes.—From διά through, βαίνω pass.—Great increase of the secretion of urine.

Diaphoretics.—From διά through, φορέω to carry.—Remedies which promote perspiration.

Diathesis.—From διατίθημι to arrange, dispose.—A morbid tendency. A peculiar predisposition to certain diseases.

Diphtheria.—From διφθέρα a skin or membrane.—An epidemic disease of the throat, consisting of the formation of false membranes, which appear on uvula and palate, tonsils and pharynx, extend into pharynx and larynx, and are at first white, but afterwards become darker. These diphtheritic patches are caused by a specific microbe, and separate by sloughing.

Dipsomania.—From δίψα thirst, μανία rage.—An insatiable desire for alcohol, observed in habitual drunkards.

Diuretics.—From διά through, οὐρέω to pass urine.—Medicines which promote an increased flow of urine.

Dysentery.—From δύς with difficulty, ἔντερον bowel.—Inflammation and ulceration of the mucous membrane of large intestine and rectum, attended with griping and mucous and bloody stools.

Dyspepsia.—From δύς with difficulty, πέπτω or πέσσω to soften, digest.—A disordered condition of the functions of the stomach. Indigestion.

Dyspnœa.—From δύς with difficulty, πνέω to breathe.—Difficult, laboured, obstructed breathing.

Ecchymosis.—From ἐκχυμόω to pour out.—A blue or black discoloration from an extravasation of blood into the areolar tissue.

Echinococci.—From ἐχῖνος hedgehog, κόκκος a berry.—Immature tapeworms or hooklets, found in hydatid cysts, most commonly in the liver.

Ecthyma.—From ἐκθύω to break out.—Skin disease characterised by large pustules and inflammation of a severe type.

Eczema.—From ἐκζέω to boil up.—An inflammatory disease of the skin, with formation of vesicles, which, from irritation or other causes, may become pustules.

Embolism.—From ἐμβόλη a wedge or plug.—The obstruction of a blood-vessel by a fibrinous concretion, which has been detached from the heart or one of the vessels.

Emphysema.—From ἐμφυσάω to inflate.—1. Infiltration of air into the interlobular areolar tissue. 2. Dilatation of air-cells, which assume the size of hemp-seeds.

Empyema.—From ἐν within, πύον pus.—A collection of pus within the cavity of the pleura.

Encephalitis.—From ἐγκέφαλος brain, terminal *-itis.*—Inflammation of the brain and its membranes.

Endemic.—From ἐν amongst, δῆμος people.—Referring to diseases peculiar to certain localities.

Endocarditis.—From ἔνδον within, καρδία the heart, terminal *-itis.*—Inflammation of the membrane which lines the interior of the heart.

Epidemic.—From ἐπί upon, δῆμος people.—Applicable to diseases which attack large numbers simultaneously.

Epilepsy.—From ἐπιλαμβάνω to seize, attack.—Sudden and complete unconsciousness, with a series of convulsive movements.

Eructation.—From *eructo* to belch.—Expulsion of wind from the stomach by the mouth.

Erythema.—From ἐρυθαίνω to redden.—Arises from some derangement of the system, and consists of a mere redness of the skin, not extending to the cellular tissue.

Etiology.—From αἰτία cause, λόγος discourse.—An account of the causes of disease.

Exacerbation.—From *exacerbo* to make angry.—An increase of the strength and fury of the symptoms of a disease.

Exanthemata.—From ἐξανθέω to break out, to bloom.—Diseases attended by an eruption on the skin of red patches, which disappear transiently under pressure.

Exophthalmic Goître.—From ἐξ out, ὀφθαλμος the eye.—Protrusion of the eyeball, accompanied by goître.

Expectorants.—From *expectoro* to discharge from the chest.—Medicines which facilitate the removal of secretions collected in the chest.

Febrifuge.—From *febris* fever, *fugo* to drive away.—A medicine which possesses the power of diminishing the severity of fever.

Fistula.—A pipe, tube, reed.—A passage with narrow opening, the result, generally, of ulcer or abscess.

Fomites, pl. of *fomes*, touchwood, tinder.—Porous substances which absorb and retain contagious effluvia, as woollen clothing, cotton materials, etc.

Fremitus, murmuring, growling.—Vocal fremitus is a vibration communicated to the hand when placed on the chest whilst the patient is speaking. It is absent or diminished in pleuritic effusion, and increased in pulmonary consolidation.

Gastralgia.—From γαστήρ stomach, ἄλγος pain.—A sensation of pain in the stomach of a burning character.

Gastrodynia.—From γαστήρ stomach, ὀδύνη pain.—Cramp or spasmodic pain in the stomach.

Gastrotomy.—From γαστήρ stomach, τέμνω to cut.—The operation of opening the stomach.

Glycosuria.—From γλυκύς sweet, οὖρον urine.—Sugar in the urine.

Gravedo.—From *gravis* heavy.—Inflammation of the membrane lining the frontal sinuses.

Gummata.—From *gumma* an elastic tumour containing a substance like gum.—Small, firm, yellow-whitish tumour surrounded by a capsule formed of degenerated tissues. Characteristic of syphilis.

Hæmatemesis.—From αἷμα blood, ἐμέω to vomit.—Vomiting of blood from the stomach.

Hæmatinuria.—From *hæmatin* the red colouring matter of the blood, οὖρον urine.—Dark-coloured urine, containing no blood, but merely the colouring matter of the blood.

Hæmoptysis.—From αἷμα blood, πτύω to spit.—Bleeding from the lungs.

Hæmorrhage.—From αἷμα blood, ῥήγνυμι to break forth.—Bursting forth or discharge of blood.

Hemiplegia.—From ἥμισυς half, πλήσσω to strike.—Paralysis affecting one side of the body.

Hepatisation.—From ἧπαρ the liver.—A term applied to the lungs when so inflamed as to be impervious to air, the structure assuming a liver-like appearance.

Herpes.—From ἕρπω to creep.—A skin disease consisting of small vesicles upon inflamed bases.

Hyaline.—From ὕαλος glass.—A transparent colourless substance.

Hydatids.—From ὕδωρ water.—Cysts filled with a limpid fluid, floating in which are the immature tapeworms.

Hydragogues.—From ὕδωρ water, ἄγω to expel.—Medicines which cause watery evacuations.

Hydrocephalus.—From ὕδωρ water, κεφαλή the head.—A collection of water within the head.

Hydronephrosis.—From ὕδωρ water, νεφρός the kidney.—Dropsy of the kidney.

Hydrophobia.—From ὕδωρ water, φοβέω to fear.—A disease caused usually by the bite of a rabid animal and consequent absorption of the rabietic poison.

Hypertrophy.—From ὑπέρ above, increase, τρέφω to nourish.—Excessive growth or enlargement of a part, caused by increase in size or number (or both) of tissue elements.

Hypochondriasis.—From ὑπό under, χόνδρος cartilage.—Morbid sensibility, mental alienation. Probably derives its name from an uneasy feeling experienced in the hypochondriac regions.

Hysteria.—From ὑστέρα the womb.—A nervous disorder confined almost entirely to susceptible females, consisting of a morbid imagination, peculiar deceptions, and amorous excitement.

Ichthyosis.—From ἰχθύα skin of a fish.—A hard, dry, scaly, non-contagious disease of the skin.

Idiopathic.—From ἴδιος peculiar, separate.—A spontaneous or primary disease. Not dependent upon another.

Immunity (*immunis*, exempt).—Immunity to disease may be defined as a condition, natural or acquired, of the animal body, which renders it resistant to the invasion of one or more infective disorders.

Impetigo.—From *impeto* to attack.—A pustular disease of the skin, forming thick yellowish incrustations.

Insolatio.—From *in*, and *sol* the sun.—An affection due to the direct action of the sun's rays. Sunstroke.

Interstitial.—From *inter* between, *sto* to stand.—By some called fibroid. Pertaining to an increase and hardening of the connective tissue.

Intussusception.—From *intus* within, *suscipio* to receive.—Introduction of one part of the bowel into another, just as the finger of a glove is pulled within itself.

Laryngismus stridulus.—From λαρυγγίζω to bawl, *stridulus* a hissing sound.—Spasm of the muscles of the glottis, usually nocturnal, preventing the entrance of air, and giving rise to hoarse, croupy cough. False croup.

Laryngitis.—From λάρυγξ the windpipe, terminal *-itis.*—Inflammation of the larynx.

Leucocythæmia.—From λευκός white, κῦτος a cell, αἷμα blood.—A superabundant development of the colourless corpuscles of the blood. White-cell blood.

Lichen.—From λειχήν moss.—A skin disease in which the papules are distinct or arranged in clusters. Very irritating and obstinate.

Locomotor Ataxy.—From ἀ neg., τάσσω to order.—An absence of co-ordination in the movements of the muscles.

Lupus.—From *lupus* the wolf.—A spreading, corroding, tuberculous disease.

Lysis.—From λύω to dissolve.—The gradual diminution and termination of a fever without critical symptoms.

Macula.—From the Latin *macula.*—A permanent discoloration of some portion of the skin, sometimes associated with alteration of its texture. It is not dependent on any disease of the constitution.

Marasmus.—From μαραίνω to waste or pine away.—Progressive wasting.

Metallic Tinkling.—A sound like that caused by striking glass or metal with a pin. A pathognomonic symptom of pneumothorax with effusion.

Meningitis.—From *meningium*, terminal *-itis.*—Acute inflammation of the pia mater and arachnoid.

Micro-organisms.—A term applied to those minute organised bodies which are found associated with various morbid states. The term "microbe" is used synonymously with "micro-organism."

Myalgia.—From *μῦς* a muscle, *ἄλγος* pain.—Muscular soreness, stiffness, or pain. Cramp.

Myelitis.—From *μυελός* marrow, terminal *-itis.*—Inflammation of the spinal cord.

Nephralgia.—From *νεφρός* the kidney, *ἄλγος* pain.—Pain and neuralgia in the kidney.

Nephritis.—From *νεφρός* the kidney, terminal *-itis.*—Inflammation of the kidney.

Nummular.—From *nummula* a little coin.—Applied to sputa lying flat at the bottom of a vessel, and having the appearance of small coins.

Œdema.—From *οἰδέω* to swell.—Dropsical swelling, from accumulation of serous fluid in subcutaneous areolar tissue.

Oidium albicans.—From *ᾠόν* an egg, *εἶδος* resemblance.—A vegetable parasite, seen on the mucous membrane of cheek and throat as white spots and patches.

Opisthotonos.—From *ὄπισθε* behind, *τείνω* to stretch.—Spasm of the neck, back, and loins, causing an arch-like appearance of the body.

Oxyuris.—From *ὀξύς* sharp, *οὐρά* a tail.—Small thread-worm.

Paracentesis.—From *παρά* by the side, *κεντέω* to stab.—The operation of removing fluid from a cavity by tapping.

Paralysis.—From *παραλύω* to relax or disable.—Diminution or total loss of voluntary motion, or sensibility, or both.

Paraplegia.—From *παραπλήσσω* to strike partly.—Palsy affecting the lower half of the body.

Paresis.—From *παρίημι* to unloose, relax.—Partial paralysis, consisting of a slight inability of movement.

Pathognomonic.—From *πάθος* suffering, sickness, *γιγνώσκω* to perceive.—Applied to the distinguishing symptom or symptoms of a disease.

Pectoriloquy.—From *pectus* the breast, *loquor* to speak.—The sound of the voice heard during auscultation, which appears to be transmitted directly from the chest into the ear.

Pericarditis.—From *περί* about, *καρδία* the heart, terminal *-itis.*—Inflammation of the sero-fibrous membrane covering the heart.

Peritonitis.—From *περιτείνω* to stretch all round, terminal *-itis.*—Inflammation of the serous membrane lining the cavity of the abdomen.

Perityphlitis.—From *περί* around, *τυφλός* blind, terminal *-itis.*—Inflammation of the areolar tissue which connects the psoas and iliacus muscles with the cæcum. *See* Appendicitis.

Petechia.—From *petechio* a flea-bite.—A small red or purplish spot, in shape and colour similar to a flea-bite, and due to subcutaneous hæmorrhage.

Phagocytosis (*φάγω*, I eat, and *κύτος*, a cell).—A term expressing the property possessed by certain animal cells, called "phagocytes," of taking into their substance solid particles, which may either be rejected or used by the cell for its nutrition, or, when the solid mass is living, may destroy the cell.

Photophobia.—From φῶς light, φόβος fear.—Aversion to and intolerance of light.—Found in certain stages of meningitis, in measles, typhus, and many diseases of the eye.

Phthisis.—From φθίω to pine or waste away.—Progressive emaciation. Consumption of the lungs. Decline.

Pleurisy, or *Pleuritis*.—From πλευρά the side, terminal *-itis*.—Inflammation of the serous membrane which lines the walls of the chest, and is reflected upon each lung.

Pleurodynia.—From πλευρά the side, ὀδύνη pain.—Pain seated in the walls of the chest, and ordinarily in the intercostal nerves.

Pleximeter.—From πλήσσω to stride, μέτρον a measure.—An ivory plate used in mediate percussion of the chest.

Pneumonia.—From πνευμονία a disease of the lungs.—Acute inflammation of the substance of the lung.

Pneumothorax.—From πνεῦμα air, θώραξ the chest.—A collection of air in the pleural cavity. If serum also present, Hydropneumothorax; if effusion purulent, Pyopneumothorax.

Podagra.—From πούς the foot, ἄγρα seizure.—Gout situated in the joints of the foot.

Prophylactic.—From πρό before, φυλάσσω to avoid.—The preventive treatment of disease.

Prurigo.—From *prurio* to itch.—A papular eruption, attended with severe itching.

Psoriasis.—From ψώρα itch, mange.—A disease of the skin characterised by patches of rough scales.

Ptosis.—From πτόω to fall.—A falling of or inability to raise the upper eyelid.

Puerperal.—From *puer* a child, *pario* to bring forth.—Relating to women recently delivered.

Purpura.—From πορφύρα the purple fish.—Purple spots and patches on the skin from extravasation, due to a morbid condition of the blood and capillary vessels.

Pyæmia.—From πύον pus, αἷμα blood.—Contamination of the blood from absorption of pus.

Pyelitis.—From πύελος a tub, trough, terminal *-itis*.—Inflammation of the pelvis, infundibula, and calyces of the kidney.

Pyrosis.—From πυρόω to burn.—A disease consisting in a hot sensation in the stomach and copious eructation of thin, watery, acid, or insipid fluid.

Pythogenic.—From πύθω to rot, γεννάω to generate.—A term applied to typhoid, gastric, or enteric fever.

Rabies.—From *rabio* to be furious.—A disease of dogs and other animals, which, if implanted by means of the saliva into the human system, produces Hydrophobia.

Râles.—From *râler* to rattle in the throat.—Liquid sounds produced by the air passing through mucous or other fluids.

Resolvents.—From *resolvo* to relax, undo.—Substances possessing the power of promoting the resolution of tumours.

Rhonchus.—From ῥόγχος a rattling sound in the throat.—*Sonorous* rhonchus is a dry deep-toned sound produced by obstruction to the tide of air in a large bronchial tube. In the smaller tubes the pitch is higher, and whistling, hissing sounds are heard, called *sibilant* rhonchi.

Roseola.—Diminutive of *rosa* a rose.—An efflorescence of transient patches of redness. Non-contagious.

Rubeola.—From *rubeo* to blush.—A disease combining certain symptoms of scarlatina with symptoms resembling those of measles.

Rupia.—From *ῥύπος* dirt, uncleanness.—A non-contagious eruptive disease characterised by flat vesicles, which are succeeded by dark and rough crusts.

Sarcina Ventriculi.—From *σάρκινος* fleshy.—A microscopic cryptogamous plant, found in the contents of the stomach in pyrosis.

Scabies.—From *scabo* to scratch.—A contagious cutaneous disease attended with severe itching.

Sciatica.—From *ἰσχίον* the hip.—A form of neuritis with pain in the sciatic nerve.

Sclerosis.—From *σκληρός* hard, tough.—A state of induration, hardness, and toughness. The term is also applied to the process by which such a state is brought about in organs and tissues.

Scrofula.—From *scrofa* a sow.—A morbid state of the system revealed by chronic swelling and suppuration of the absorbent glands, etc.

Septicæmia.—From *σήπω* to rot, *αἷμα* blood.—Putrid infection. A morbid state of the blood, due to the presence of bacteria, *i.e.* rod-like microscopic bodies.

Sequelæ.—From *sequor* to follow.—Morbid affections left as the result of a disease.

Shingles.—From *cingulum* a girdle.—The popular name for Herpes zoster, a vesicular disease which compasses half the circumference of the body.

Stenosis.—From *στενόω* to make narrow.—Contraction of a vessel.

Stercoraceous.—From *stercus* excrement.—A term applied to fæcal vomiting.

Stomatitis.—From *στόμα* a mouth, terminal *-itis.*—Inflammation of the mouth, which may be parasitic, vesicular, ulcerative, or gangrenous.

Subsultus Tendinum.—From *subsulto* to leap.—An involuntary twitching of the tendons, generally observable at the wrist. Evidence of great cerebral irritability.

Sudamina.—From *sudo* to sweat.—Small transparent vesicles which appear in numbers upon the skin in diseases accompanied by sweating.

Sycosis.—From *σῦκον* a fig.—An eruption of inflamed tubercles clustering about the beard and scalp. Ringworm of the beard.

Syncope.—From *συγκόπτω* to knock to pieces.—Partial or complete suspension of respiration and the action of the heart. Sudden prostration.

Syphilis.—From *σύν* with, *φιλέω* to love.—An infectious disease communicable usually during coition.

Tabes.—From *tabeo* to decay.—Emaciation, usually the result of tubercular degeneration.

Tabes dorsalis.—A synonym of locomotor ataxy.

Tænia.—From *ταινία* a band or ribbon.—The tapeworm.

Tenesmus.—From *τείνω* to stretch, to strain to the utmost.—A painful desire to go to stool, with great straining.

Thrombosis.—From *θρόμβος* a clot of blood.—Partial or complete obstruction of a vessel by a morbid product formed at the occluded spot.

Tinea circinata.—From *tinea* a gnawing worm, *circinatus* to be compassed about.—A contagious and parasitic disease attacking the general surface of the body, and characterised by rings, spreading from a centre.

Tinea decalvans.—From *decalvo* to make bald.—Falling-off of the hair, leaving little circular or oval bald patches.

Tinea favosa.—From *favus* a honeycomb.—This parasitic disease affects the scalp, and the hairs are found to pierce a small, dry, cup-shaped, yellow scab.

Tinea tonsurans.—From *tondeo* to shave.—A disease of the scalp, in which are present patches of baldness, with scaly eruption.

Tinea tricophytina.—From *θρίξ* the hair, *φυτόν* a vegetable.—A vegetable parasite affecting the scalp, the hairy part of the face, or any portion of the skin, producing ringworm.

Tinea versicolor.—From *verso* to turn, *color* colour.—A vegetable parasitic disease marked by the presence of yellow-coloured patches on the chest and abdomen, and covered with small scales.

Tonic Spasm.—From *τείνω* to stretch.—Referring to rigid contraction of the muscles without relaxation.

Tophi, pl. of *tophus* or *tofus*, volcanic rock.—Chalk-stones. Concretions of urate of soda with animal matter found in the joints of gouty subjects.

Trichina spiralis.—From *θρίξ* a hair, *σπεῖρα* anything wound round. —A species of entozoa affecting the voluntary muscles.

Tuberculosis.—Diminutive of *tuber* elevation or excrescence.—A morbid condition distinguished by small nodular lesions found in the organs and tissues, and by the presence of a special bacillus.

Tympanites.—From *τύμπανον* a drum.—Accumulation of wind in the bowels, marked by a spherical projection of the abdomen, and increased resonance on percussion.

Typhlitis.—From *τυφλός* blind, terminal *-itis.*—Inflammation of the cæcum. *See* Appendicitis.

Typhoid.—From *τυφόω* to make dull or restless, *εἶδος* resemblance.—A slightly contagious fever, distinguished by increased vascularity of Peyer's glands, followed by ulceration.

Typhus.—From *τυφόω* to make dull or restless (or *τῦφος* smoke).—A continued contagious fever marked by great prostration and mental disturbance.

Uræmia.—From *urea*, and *αἷμα* blood.—A condition due to accumulation of urinary products in blood poisoning nervous system.

Urticaria.—From *urtica* a nettle.—An affection distinguished by an eruption of wheals, resembling the elevations produced on the skin by the stings of nettles.

Varicella, chicken-pox.—Diminutive of *variola.*—A mild eruptive disorder characterised by transparent vesicles of the size of a pea, and appearing in successive crops.

Variola.—From *varius* spotted.—A contagious disease marked by fever and an eruption passing through papular, vesicular, and pustular stages. Upon shrinking of the pustules scabs are formed. Small-pox.

Vibices, pl. of *vibex* the mark of a stripe.—Large purple spots appearing under the skin, and found in purpura, scurvy, small-pox, typhus, and hepatic and splenic diseases.

ZYMOTIC. — From ζύμη leaven, yeast. — Zymotic diseases are those which depend on some morbid poison acting on the organism in the manner of a ferment. They are contagious, febrile in character, and rarely attack the same person more than once.—Zymotic diseases are—small-pox, chicken-pox, typhus fever, typhoid fever, scarlet fever, the plague, measles, hooping-cough, and mumps.

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